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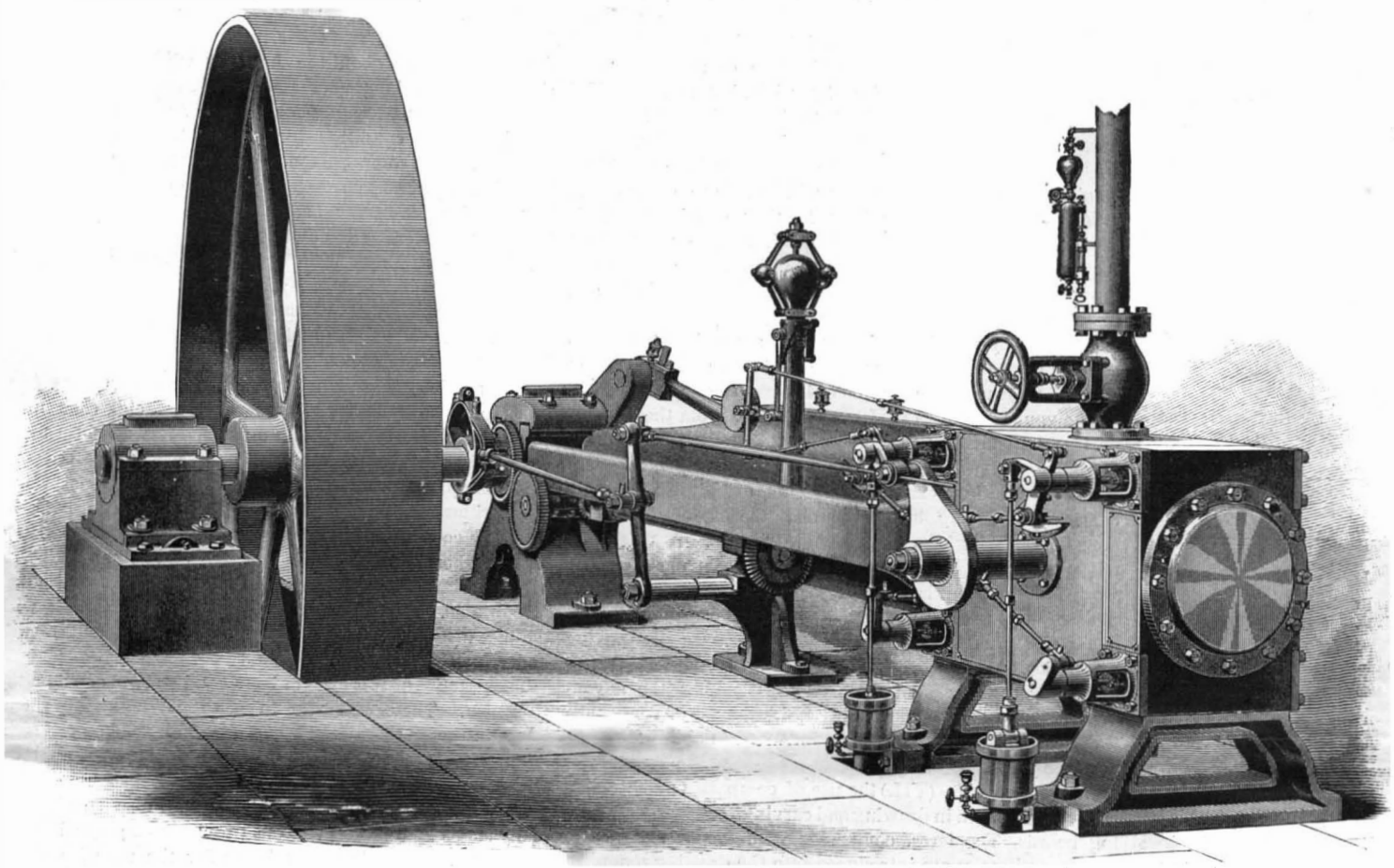
A MODERN STEAM ENGINE.

The Hamilton-Corliss engine shown in our engraving is one in which the highest perfection has been reached by the introduction of every available modern improvement which adds to the economy, regularity, and durability of the machine. The material is disposed to the best advantage for strength, while due attention has been given to beauty of design. The well known Corliss cut-off is used, and very high economy in the use of steam has been secured.

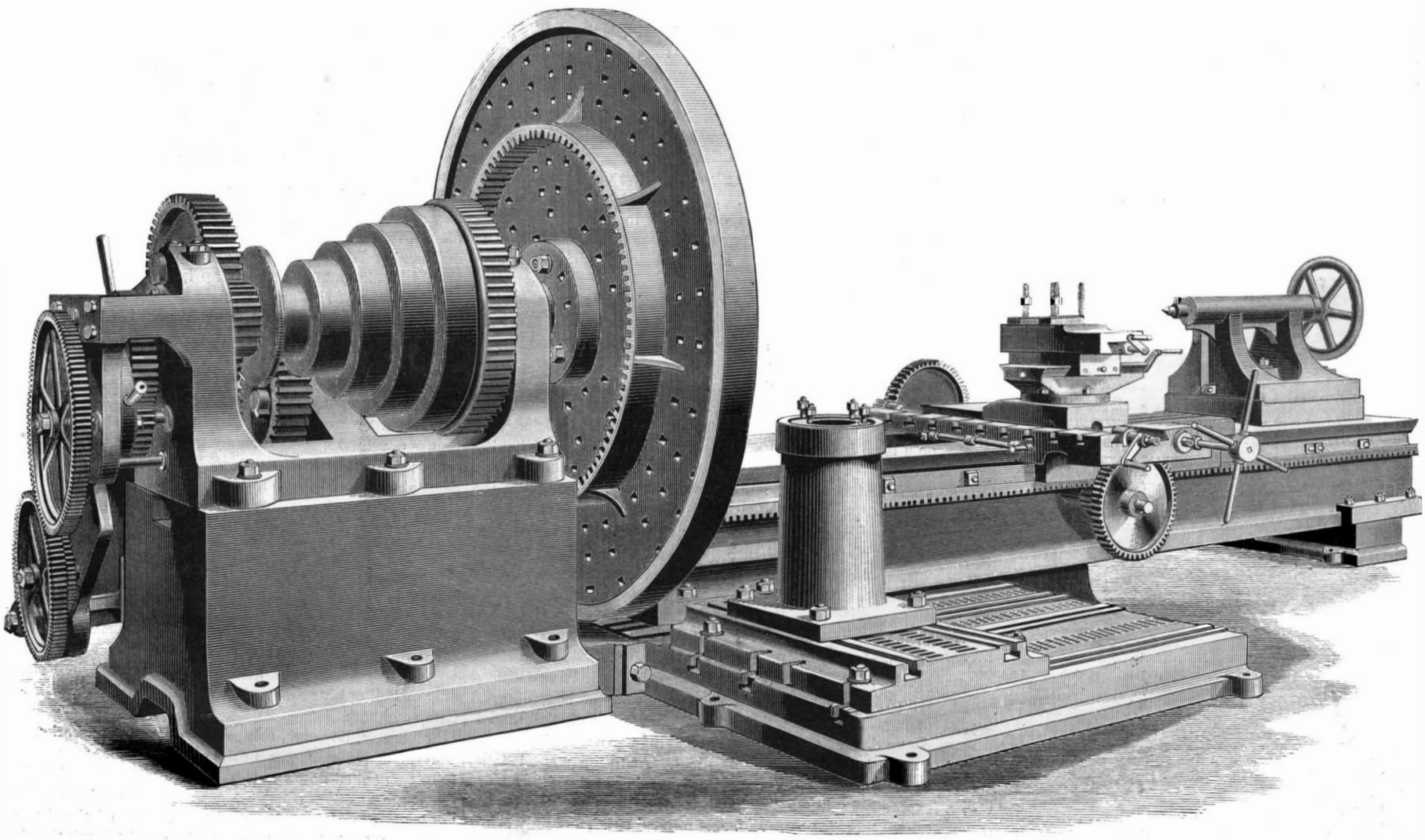
The patterns are all new, and designed according to the modern ideas of steam engineering. The engines are made in sizes varying from 12 × 30 inch cylinder to 24 × 60 inch cylinder. A new high speed governor has been applied which insures a very prompt action of the cut-off, with consequent regularity of motion with a varying load. These engines are manufactured by the Hooven, Owens & Rentschler Co., of Hamilton, O.



THE HAMILTON-CORLISS ENGINE.

ASQUITH'S BRAKE LATHE.

We illustrate a very powerful brake lathe recently constructed by Mr. W. Asquith, of Halifax, and supplied to H. M. Dockyard, at Chatham. The height of the center is 24 in., and the size of the brake sufficient for the reception of an object 8 ft. in diameter and 6 ft. wide. The fast headstock can be worked either in single, double, or treble gear, and has a cast steel spindle working in parallel gun-metal bearings. The face plate is 8 ft. in diameter, and many of the gear wheels are of steel. The loose or sliding headstock is arranged to move transversely for turning taper objects, and is securely fixed to the bed by three bolts. The loose bed is 18 ft. in length, and can be moved in and out by hand or power to vary the width of the brake. The carriage carrying the compound slide-rest derives its self-acting motions for sliding and surfacing from a back traverse shaft, and for screw cutting from a guide screw inside the standing bed. In the front of the brake is a bed-plate provided with a standard for carrying a compound slide rest for turning objects of large diameter. This rest has its self acting motions operated from an overhead feed motion. Its weight is 25 tons; it is, says *Engineering*, a very strong tool, and is calculated to execute the heaviest class of work within the limits of its size.



BRAKE LATHE AT H.M. DOCKYARD CHATHAM.

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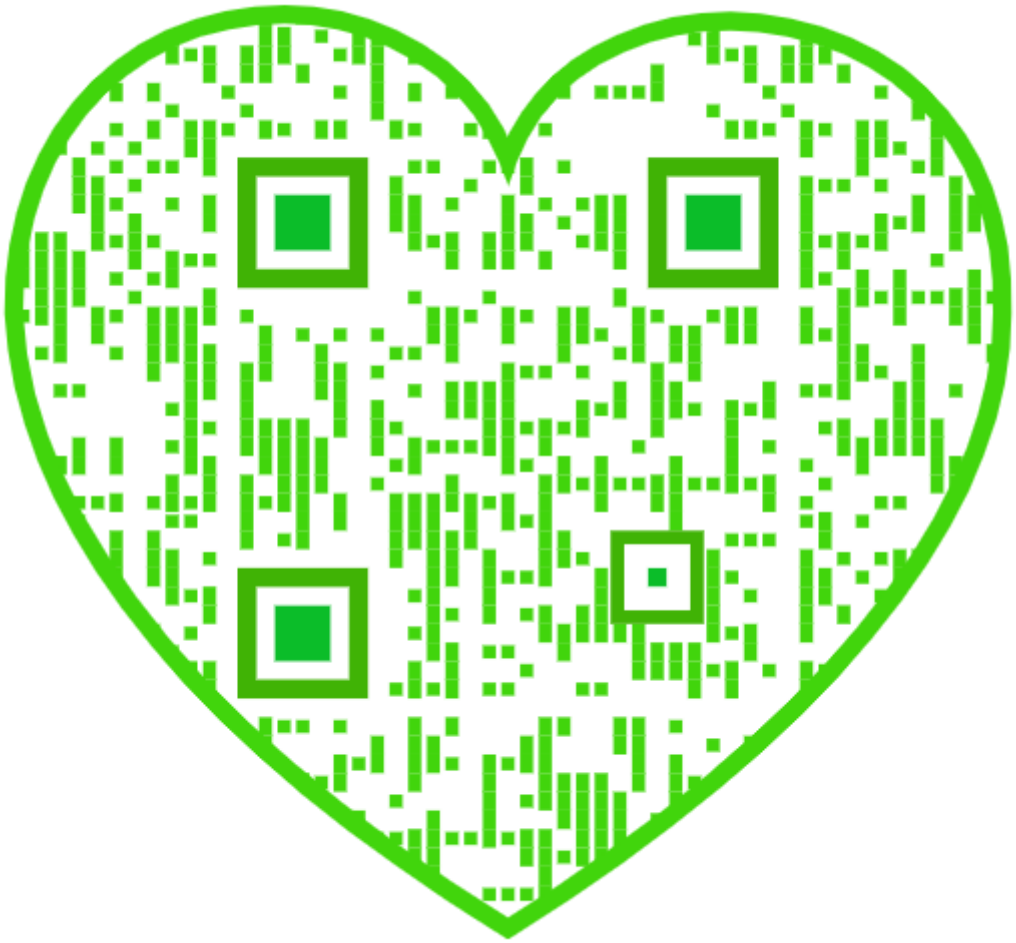

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NEW YORK, SATURDAY, JULY 14, 1883.

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THE WORKINGMAN'S SCHOOL.

We have frequently had occasion to refer to the growing dissatisfaction felt with our present system of school culture, and the efforts made to improve it. At the College of the City of New York, preparations have begun for the erection of a workshop, and in some of the public schools in Boston one of the school rooms has been converted into a carpenter shop where the boys spend a few hours each week in learning the use of tools.

A large and well ventilated building has recently been erected in West 54th Street, New York, for the accommodation of a "workingman's school." This name does not, as many suppose, imply that it is a trade school, nor yet a school for men, but that its benefits are intended to accrue to the children of the workingmen, who may themselves become workingmen. It is in fact a post-graduate kindergarten, taking children at that susceptible age when their faculties have been aroused in the kindergarten, and, by substituting work for play, continuing the natural method of object teaching. In the kindergarten, however, the child learns by *observation*, in the school he learns by *creation*, by the production of things. This creative method, as applied to education, is not intended, in that school at least, to make the child machine-like or subserve "the bread and butter interests" of later life, but to be applied to the training of the intellect, to the development and refinement of the taste, to the formation of character. Such are the aims and purposes of the founders of the Workingman's School. In how far they will be able to carry out in practice these high ideals, how far they can impress their thoughts upon the material at hand, and to what extent they will realize their own expectations, time alone can prove. Teachers have to be trained, methods devised, and details arranged.

The present workings of the school are such as to encourage the hope that much will be realized, and a glance at some of their methods may be of interest to our readers.

The youngest class (VIII.), as it comes from the kindergarten, which is in the same building, are taught to draw as well as to make things. The workshop and atelier are side by side. For example, the first exercise in drawing consists in placing before the class the model of a house, the end consisting of a square and triangle. A ruler and triangle are used in drawing it on drawing paper. In the workshop the pupil lays out a square of the same size on a piece of clay, and then carves it out, thus learning the use of the chisel and try-square. So the exercise of drawing rectangles, parallelograms, and triangles on paper is followed by carving them from clay. Clay has the advantage over wood that it does not require the use of very sharp tools, which could not be safely intrusted to children of six or seven years.

In the next class (VII.) the use of compasses and dividers is introduced both in drawing and carving. In class VI. drawing boards, T-squares, compasses with pencil and needle points, and scales are introduced into the drawing room. In the work room geometrical forms are cut from pasteboard. A cube, prism, pyramid, etc., are made from pasteboard after solid models. In the next class (V.) the pupil gains an idea of area and of a unit of area, while the use of a hand bracket saw is introduced. These four classes are already at work, and their productions are viewed with interest by those who visit the school.

In addition to the work above described, the pupils learn to model in clay from copies, and then make plaster casts of their own work. This affords an opportunity for awakening the slumbering art instincts, as they learn to model leaves, heads, and ornaments.

Instruction is not limited to the few subjects above mentioned, for there are many other things that go to make up a general culture. Reading and writing are taught simultaneously, as in Germany. A word is broken up into its elements and written by the children in script. Beginners in arithmetic use little numbered blocks of two sizes for tens and units. No slates are allowed, being injurious to eyesight.

In teaching geography one year is spent on the city, another on the State. It has been found that in the next year the children are able to master all of the United States, and draw the maps.

Music and calisthenics receive due attention, and are made as attractive as possible.

In 1881 and 1882, two weeks were spent in out-door life on a farm in the country, Sherman, Wayne Co., Pa., having been the spot selected. The results were most satisfactory. There in the woods, and among the hills, and along the streams, they gained not only new health and vigor, but also that more vivid realization of natural objects which contributes greatly to enhance the value of their winter study.

The pupils in this school, it must be remembered, do not represent the best possible material to work upon, being taken mostly from the tenement houses of a large city. Yet the principal, in his last annual report, says: "We have very few, perhaps 1 in 100, that deserve to be called bad; that is, persist in an evil practice in the face of gentle but continued repression of bad propensities and encouragement of good ones, which marks the ordinary discipline of the school. As a rule, the children of the workingman's school are wide-awake, but cheerful and obedient. As to the mental status of the school,' he says, "a good number of the children are exceedingly intelligent, and in the 150 members of the school there is no really feeble minded child, and only a few are slow or stupid.'

Whether the system of education here introduced for the first time shall prove worthy of imitation in schools for the wealthy or well-to-do or not, there can be no doubt that this school is doing a good work among the poorer classes of New York.

LOSS BY LACK OF SYSTEM.

The manufacturer can usually, by reference to his books, ascertain the cost of any article of his production, and the amount of his regular daily expenses. He can discover how much material has been lost by waste, and possibly he can make approximate allowance for loss by incompetence of his workmen. But there is one source of loss that cannot be readily estimated, and yet exists and has its effect on the results of the year's production. This is the loss from the lack of a rigid system in the using of tools and from the habitual carelessness this want of system encourages.

In every shop there must be tools that are for general use and are not individual possessions. If each successive user mislays a tool that is intended for general shop use, the aggregate of time lost in seeking for it may amount to a serious waste. Drills, taps, reamers, boring bars, arbors, milling tools, wrenches, and other implements may be intended for general use all about the shop, but when not in use they should have a home—an abiding place—so that no time would be lost in searching for them. And they should be left in proper condition for immediate use, either by the last user, or by some person whose business it is to keep them in condition. In every large shop provision should be made for this purpose, a repairer or sharpener being designated to perform this duty.

Attention to these little details is fully as important in small shops as in larger ones; for sometimes the loss of small sums occasioned by carelessness will seriously affect the balance sheet. A good practice, which is a rule in many large establishments, could be followed in smaller ones with saving results. This is to have a series of shelves or pigeon holes to contain the drills, reamers, arbors, etc., each numbered and each provided with a marked tag of sheet metal designating the tool. Every workman has a hook convenient to the pigeon holes, with a card bearing his name. When the workman takes a tool from its rack, or pigeon hole, he hangs its corresponding tag on his hook. A single glance shows where the missing tool is, and when it is returned to its place its tag is replaced over the corresponding pigeon hole. In effect, the workman charges himself with the tap, drill, or other tool when he takes it, and credits himself with it when he returns it.

The practice of this system has a good general effect on the workmen. They cannot fail to see the advantages to themselves in the saving of vexation in an aimless search for a missing tool; and the habit of care for general shop tools will extend to a similar care for their own bench and machine appliances. A saving of time could also be made in many shops by a more generous provision of general bench appliances. A single bench block for the use of a dozen vise men is not enough; it would be well if every vise had a bench block, a casting say eight or ten inches long, by four or five inches high and wide, planed on one face and side. Its cost is trifling and its uses many. It saves the hammering on the vise, and the defacing of the bench when used for straightening rods and small forgings. Encouragement to order in the care of lathe and planer tools would be given by providing for each lathe a handy tray, or sliding shelf of wood, to lie across the ways; lathe tools should never be laid on the ways of a lathe; the nicely trued surface of the Vs of a lathe cannot stand the batter of steel tools as they are usually dropped from the hand. Such a tray is useful, also, on the platen of a planer, which is too commonly used as a general receptacle for anything that should be laid on a bench.

Every shop should be provided with boxes or other conveniences for holding bolts, nuts, washers, angle irons, and blocks, for lathe and planer use, and boxes for receiving odds and ends not of present apparent value. These boxes should be distinct from the scrap heap, which ought to receive nothing of real possible shop use. They not only conduce to habits of order, but are valuable magazines to draw from in cases of emergency.

SCIENCE ON SORGHUM.

No subject connected with our agricultural resources is to us of greater national importance at the present time than that of sorghum. This to many may seem a stronger statement than truth will warrant. *Sorghum* has become to some degree a sort of by-word, for though largely cultivated in the Western and Northwestern States, and producing annually a return worth about $8,000,000, still it has confessedly failed to do what was expected of it. Somewhere about thirty years ago the Chinese variety of the plant (the varieties are numerous) was introduced into this country, and the excitement in relation to it was not small. Its sugar producing qualities were extolled above measure; our sugar trade was to be revolutionized, so to speak; every farmer was to have a little mill, and a little kettle, and he was not only to boil out his own sugar, but to supply his less fortunate neighbors.

Some way, however, things did not seem to work right. The sugar no doubt was in the sorghum cane, for when its juice was boiled down a sweet sirup was obtained, but there the demonstration stopped. The sugar was in the sirup, but it most persistently refused to come out of the sirup; it could not be induced to crystallize; and though the sirup

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had a certain degree of value, yet it was not the thing wanted, and in the disappointment the popular feeling swung round to the unjust judgment of condemning sorghum, simply because it had been the victim of ignorance and mismanagement. Such utter and inexcusable carelessness and negligence prevailed in the treatment of the plant, that even the sirup was often nearly spoiled, and had a nauseous, disgusting, "burnt pumpkin" flavor which could not fail to bring it into disgrace, and most justly so for itself, but not justly so for the plant from which it was derived. Recent researches however have done much toward explaining and removing the difficulties which have been in the way of successfully crystallizing the sugar from the juice of the sorghum.

Part of this has been accomplished by work in the laboratory and part by work in the field, the mill, the boiling house, etc., and they together have shown that the statement made above of the "national importance" of sorghum is not an exaggeration. The report presented by a committee of the National Academy of Sciences in 1882 has just been published as a Senate document. It is entitled, "Investigation of the Scientific and Economic Relations of the Sorghum Sugar Industry, being a Report made in Response to a Request from the Hon. George B. Loring, U. S. Commissioner of Agriculture." The committee consists of Prof. Bremer, of Yale, Prof. Chandler, of Columbia, Prof. Johnson, of Yale, Prof. Silliman, of Yale, Prof. Smith, of Louisville, and Dr. G. E. Moore, of New York.

The report shows clearly that essentially the two points on which success depends are maturity of the cane, and prompt correctness in working. With these sugar from a field of sorghum can be as surely and safely expected as from a like field of sugar cane, and with perhaps fully as great a return.

The immense possibilities which such a revelation opens for the future sugar crop of the United States must be discussed at another time.

THE STORAGE OF WIND POWER.

The great question of all questions at the present day, in the line of invention and mechanical application, is, How can we best turn to account the natural forces which are in play about us? Setting aside for the present the direct use of electricity as a motive power, we have two fluids at our command, air and water. Both have from time immemorial been pressed into the service of man, and yet even at this moment, with all the modern advances in practical science, we are only on the threshold of the workshop in which we ought to have full command. It is not too much to say that of the power exerted by the movements of water and of air throughout the world, the percentage utilized is so small as to be practically inappreciable. Let our inventors look to this, for it is a field which promises well.

The idea of using the power of water-falls at a distance, transmitting the energy by means of—say compressed air, or electric wires—has been often suggested and tried, but thus far with no very satisfactory results. The loss of power through the agents employed in transmission has been so great as to much impair the economic value. But let us take up another line of thought, and see if we cannot start some inventive brain into a plan which will bring out something practical. The power to which reference is made needs no transportation; it is ready at hand; it is simply the wind.

It seems incomprehensible that such a ready and potent agent should escape practical use so completely as it does. The probable reason for this is that the power is destitute of all uniformity, and has on that account hitherto been deemed unmanageable; sometimes furious, sometimes absolutely nothing, and at all times unsteady and capricious.

Before referring again to this feature, let us estimate for a moment the amount of power at our command, within a given space, *if we can only control and utilize it.* We will assume an area 40 by 150 feet, no larger than the flat top of many a manufacturing establishment, store, etc. Within this extent it is entirely practicable to place thirty-two wind-wheels, each 12 feet high by 8 feet in diameter, and so arrange them that each shall have full sweep of the wind from whatever quarter it may blow. The wheels here contemplated would revolve on vertical axles—or horizontal if preferred—with fixed blades, one-half shielded and turning so as to suit the direction of current. They would need no attendance, no brake, no check, let them spin with the utmost fury of a gale, or lie still in a calm. Rapid motion could do no harm, only increasing their efficiency; whenever they turned they would do work, when they lay still they would do nothing. Each wheel would drive an air-pump of size suited to its power, and each stroke of the piston would send its given quantity of air into the common reservoir provided. That reservoir becomes then a magazine of compressed air whose energy is reported by the gauge, and is used by any of the means now so well known.

A wind-wheel of the size stated carries on each of its blades a surface of 48 feet. The pressure of wind in what is known as a "strong breeze" is about 2 pounds per square foot, and its rate of motion about 1,750 feet per minute. It is easy to see, therefore, that theoretically the efficiency of such a wheel in such a wind is safely reckoned at five horse power.

But here comes in the difficulty, and it is *the* difficulty of all and must be overcome, or this power is of practically no value in the line of which we have been speaking. The power is capricious, and unless we can steady it no form of business can depend on it for service. How shall we *store* the power that may come to us by day or by night, Sundays and week days, gathering it at the time when we do not need it and preserving it till we do? This is the problem. Who is the man to solve it. Surely it should not be set aside as too difficult for trial.

Why should it not be dynamized into electricity? No distant transmission with its loss of energy comes into play, for a line of shafting can be driven directly on the spot. It is true the whole field of electric storage is yet too little explored to answer this question on the instant, but is it not worth considering?

Other modes of turning to account the compressed air, and using it only as needed, are also within our reach.

A factory or other building, of the size already given, with the wind-wheels on its roof, taking the average rate of the wind as it is known to be in our region and climate, has at its command, if it can *store* the power, at a fair and moderate estimate, 4,200 horse power per week, thus giving it a 70 horse power engine for six days of ten hours each. And this power is without engineer, without fuel, without labor; practically without expense.

Store the wind power, and render it of even application, and all this is perfectly possible. Shall we admit that this cannot be done?

W. O. A.

THE AURANIA'S BROKEN ENGINES.

The new Cunarder Aurania which left Liverpool on June 23, after having made a quick and pleasant run, broke one of the connecting rods of her engine, on Sunday morning, July 1, when off the eastern end of Long Island. The accident which was caused by a flaw in the connecting rod, resulted in the almost complete wreck of the engine, cracking the cylinder, knocking off the cylinder head, and doing much other serious damage. At the time of the accident the shaft was making sixty-one revolutions to the minute, with a steam pressure of 85 pounds. The speed of the vessel was 17¾ knots.

Capt. Hains estimates the damage at more than $100,000. The ship will have to go to the Clyde under sail. It will probably take a year's time to repair the damage. The Aurania is a Clyde built steamer of 7,500 tons register. She was a new vessel, and this was her first trip out.

She is regarded as a very fast steamship. During the trip as high as 429 miles was logged in one day.

The disabled vessel was towed into this port by six tugs.

Heat from the Sun.

The Mount Whitney observations show the sun to be hotter than was supposed. The heat received at the earth's surface is probably more by one-half than was estimated by Herschel and Pouillet, and even materially exceeds the values assigned by more recent investigators. It would in one year melt a crust of ice over the whole sunward half of the earth six hundred feet thick. This is, of course, a statement in very round numbers. The scientific phrase would be that the sun's vertical energy would raise the temperature of one gramme of distilled water three degrees Centigrade per minute for each centimeter of the earth's surface nominally exposed.

Having supplied us with an increased amount of heat, the Mount Whitney experiments also favor us with new figures of intenser cold. The estimates of Herschel and Pouillet made the temperature of space 224° below the zero of Fahrenheit. The new results carry it down nearly to the calculations for the absolute zero, the absence of all heat, say minus 450° F. To the non-scientific mind the distinction between such far down temperatures is not unlike that between the pains of rheumatism and those of the gout—the first being as from a thumbscrew twisted to the last point of human endurance, the gout giving one turn more.

Further, it appears that the direct heating power of the sun cannot raise a thermometer quite 50° F. above its surroundings whatever they may be. If we suppose the whole globe a thermometer and without an atmosphere, the sun could only heat it fifty degrees above the cold of space, leaving it at about minus 400° F. under full sunshine. The internal heat of the earth may be disregarded in these calculations. It seems paradoxical to say that if the atmosphere were removed from the earth its surface would receive more heat and yet be much colder. But this is a fact of the same kind as our experience in ascending a mountain. The atmosphere does indeed cut off a great deal of heat, but on the other hand it keeps a great deal of that which it permits to pass through. When the air is heated up to its retaining capacity, an "equilibrium" is established.

To illustrate, let us imagine a large, empty, windowless hall, with two doors partially obstructed by Centennial turnstiles, one for entry and one for exit. A procession of one hundred persons enters per minute. At first there is abundant room; few want to come out. At the end of the second or third minute perhaps only three people are leaving for one hundred arriving. After a longer interval the number of departing guests is much greater. At last the hall is crowded to its utmost capacity, and if we still suppose one hundred per minute entering, it is absolutely certain that one hundred per minute must be getting out. This final condition is one which we may call equilibrium. If the turnstiles of Centennial pattern record their turnings, we can ascertain exactly how many people are in the hall at any moment. Now to apply the illustration to heat-bearing rays entering our atmosphere, we may suppose that nearly all reach the soil through radiation; but ninety per cent go out through the regular exit of "convection;" nine per cent squeeze back through the turnstile by which they entered—"radiation;" and one per cent climb out through the chimney of "conduction." It follows that by merely regulating the turnstiles, by modifying this capacity for selecting and holding rays of certain wave lengths, atmospheres could be constructed which would keep the planet Mercury cool or the far off Neptune comfortably warm. Here is a hint for romancers who wish to plant their *dramatis personæ* in some other world.

The Allegheny and Mount Whitney observations firmly establish the fact that the sun is blue. The particular shade of color which it has, if viewed without intervening atmosphere, may be laid down as that on the border of the blue near the green, about where the line *F* appears in the spectrum. Sad to say, this is not an "æsthetic" hue; it is more like that referred to in one of Southey's poems: "You could almost smell brimstone, their breath was so blue, for he painted the devils so well."—*William C. Wyckoff, in Harper's Magazine.*

Bids for New War Vessels.

The bids for the construction of the three steel cruisers and the dispatch boat ordered by the last Congress, were opened July 2 in Washington, and it was found that John Roach & Sons' bids were lower in every single instance than any others, and they will probably be awarded the contracts.

For the 4,500-ton steel cruiser C. H. Delamater & Co., New York, bid $1,163,000; the Harlan & Hollingsworth Company, Wilmington, $1,120,000; Cramp & Son, Philadelphia, $1,080,000; John Roach, Chester, $989,000. Each bidder sent in a $30,000 certified check with his bid.

For the 3,000-ton steel cruiser the following bids were made: The Harlan & Hollingsworth Company, $777,000; Harris, Loring & Co., Boston, $748,000; Cramp & Son, $650,000; John Roach & Son, $619,000.

Each bidder sent in a $20,000 check.

For the 3,000-ton cruiser the following bids were made: Harlan & Hollingsworth Company, $775,000; Quintard Iron Company, New York, $763,400; Cramp & Sons, $650,000; John Roach, $617,000.

Each bidder sent in a $20,000 check.

For the dispatch boat bids were made: H. A. Ramsey & Co., Baltimore, $420,000; Allen & Blaisdale, St. Louis, $380,000; Cramp & Son, $375,000; John Roach, $315,000.

It is believed in Washington that the vessels can be built and finished in eighteen months, if the armament can be procured in time.

The Despised Trade Dollar.

Since the 1st of July the trade dollar has come into such disfavor that it no longer passes in this city at par. The brokers are buying them at 85 cents, but Government officers advise parties to keep them, intimating that Congress will at its next session provide some measure for their redemption. According to one of our contemporaries, the trade dollar is intrinsically of more value than the modern silver dollar. The trade dollar contains seven grains more silver than the standard dollar and is a better coin. But Congress never endowed it with legal tender attributes. It was originally coined for use in the Chinese trade, at a time when our currency was paper, as a favor, it is said, to the bonanza silver kings, who wished to find some use for the product of their mines.

Adulterated Teas.

Under the operation of a new law against the importation of impure teas, more than 3,000 packages of tea brought from Shanghai, China, and valued in the market, if sold, at $20,000, were condemned recently by the appraiser at the port of New York. The teas were mixed with sand and gravel, exhausted tea leaves, and dirt and paste rolled into pellets to represent dried leaves. In several instances the impurities were evident to an inexperienced observer. When taken in the hand and crushed between the fingers, the sand was plainly visible.

About 500 packages of colored Japan tea, of which a greater portion was dust, were also rejected after a careful examination. This tea was of high color and mixed with mineral substances to increase the weight.

The Gradual Cooling of the Earth.

IN a "Treatise on Natural Philosophy," by Professors Sir W. Thomson and P. G. Tait, Sir W. Thomson, speaking of an opinion advanced by Sir Charles Lyell, respecting the possible maintenance of the earth's heat without change throughout countless ages, used words which, says *Knowledge,* may be applied without change of a word to the stupendous theory advanced by Sir C. Siemens not so very long since—such an idea of a practically endless cycle "violates the principles of natural philosophy in exactly the same manner, and to the same degree, as to believe that a clock constructed with a self-winding movement may fulfil the expectations of its ingenious inventor by going for ever." The earth is necessarily cooling from century to century; her volcanic energies are certainly diminishing, as certainly, to use an illustration of Sir W. Thomson's, as the quantity of gunpowder in a "monitor" is diminishing when hour after hour she is seen to discharge shot and shell, whether at a nearly equable rate or not, without receiving fresh supplies of ammunition.

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THE FISHERIES EXHIBITION, LONDON.

Among the interesting novelties at the Fisheries Exhibition, London, besides the American gaslight buoy, and the pneumatic alarm buoy, is Capt. Cator's tidal buoy, which we here illustrate. It is arranged something like a ship's log, and is towed astern of a vessel in the same manner. The motion causes the screw upon the buoy to rotate, the number of revolutions varying, of course, with the speed of the ship. Connected to the spindle of the screw is a hammer which strikes a gong. A number of these buoys are used in the British navy, their special object being to denote to another vessel astern the speed of the one ahead. This is readily ascertained by counting the beats of the gong per minute.

They are intended to be used during the prevalence of fog, and although they may be serviceable for squadron evolutions, would [illegible] we imagine, be of much good to the passenger marine.

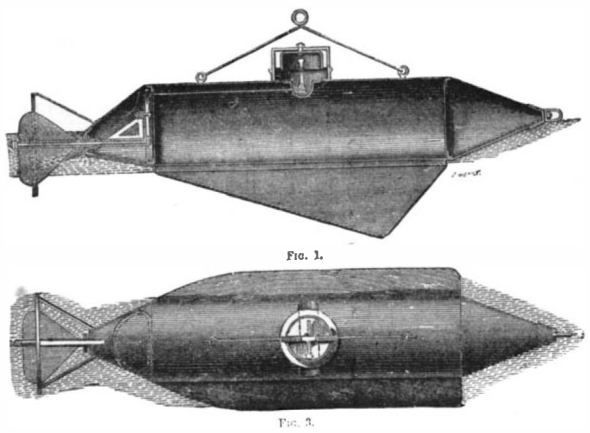


FIG. 1.

FIG. 2.

FIG. 3.

CAPT. CATOR'S FOG ALARM BUOY.

A Signal Station at Mount Whitney.

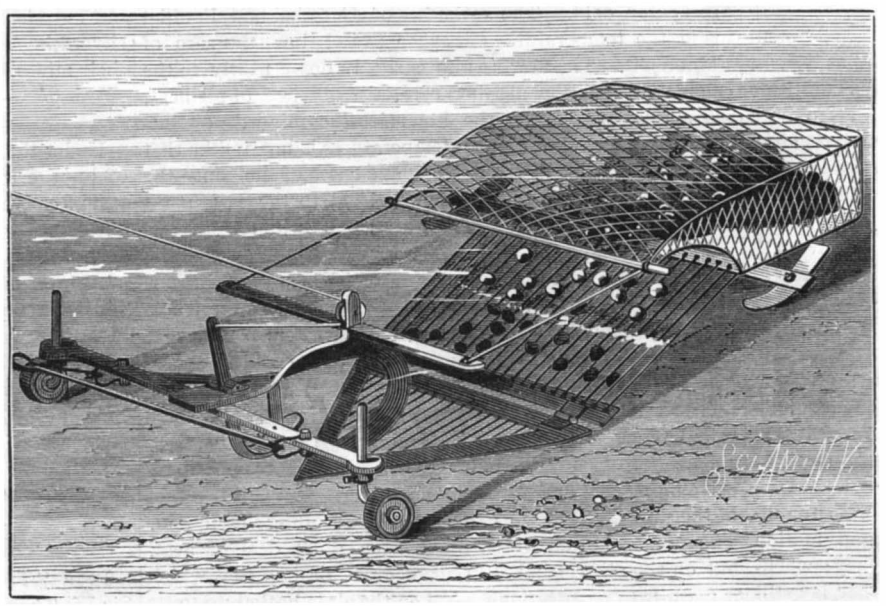
The Government has determined to establish a signal service station on the summit of Mount Whitney, and during the coming summer a detail from the engineer corps at the Presidio will be sent thither to make the necessary survey for that purpose. Mount Whitney is supposed to be the highest peak in the United States, having an altitude of 14,898 feet above the sea level. It is described as "the culmination point of an immense pile of granite, which is cut almost to the center by numerous steep, and often vertical canyons." It is situated on the west border of Inyo County, Cal., near the center of the Sierra Nevada, and about 325 miles southeast of San Francisco.

The station will have an elevation more than double that of the station on Mount Washington, New Hampshire. At the latter station the winter gales attain a speed of 100 miles per hour. As the data on which storm predictions for this coast are obtained from stations north of San Francisco, that on Mount Whitney will not be as useful to this coast as the Mount Washington station is to the eastern seaboard. It will, however, serve for many important scientific purposes. The signal station at Point Barrow, the most northerly extremity of the western coast of North America, latitude 71° 24′ N., is to be abandoned, and a vessel will be sent up next month to remove the party stationed there. There the winds in winter blow with a speed of over 100 miles per hour, and the mercury sinks below 50° below zero.

DREDGE FOR SHELL FISH.

The novel dredge shown in the engraving resembles in some respects a potato digger. It has a plow to run under the sand, a grating for raising the shell fish out of the sand, and a wire net or bag to receive the shell fish, while allowing the sand to wash through. The plowshare is jointed to the grating, and the forward end of the plow beam is provided with an axle having two ground wheels for guiding the plow and limiting the depth of the cut. Near the forward end of the plow beam there is a bent lever, having at the lower end a shoe for riding on the sand, and at its upper end an eye for receiving a cord which runs under a pulley and thence forward, upward, and out of the water. By pulling this cord, the shoe is thrown down so as to raise the plow beam and cause the plow to run on the surface.

This is an improvement over the present system of dredging shell fish. Mr. Augustus F. Friend, of Gravesend, N. Y., is the patentee of this invention.



FRIEND'S DREDGE FOR SHELL FISH.

What is Carbon?

M. Berthelot, in the *Journal de Pharmacie et de Chimie*, treats of the elementary constitutions of carbon in a somewhat novel style. He says that from certain peculiar physical relations he is inclined to think that the true element of carbon is not yet known, and that it will eventually be found that graphite and diamond are not really identical, but are substances of a different order. M. Berthelot alleges that elementary carbon ought to be gaseous at ordinary temperatures, and that the various kinds of carbon which occur in nature are in reality polymerized products of the true element of carbon. Spectrum analysis is considered to confirm this view; for a spectrum recognized along with that of hydrogen in the light of comets is held to indicate a gaseous carbide, probably acetylene. If this hypothesis should be maintained by further research, it will be shown that the claim advanced on behalf of hydrogen to be considered as the fundamental element of the universe must be modified to embrace carbon. The spectrum in question is also shown by the Geissler tube.

ENGLAND, with 27,000,000 inhabitants, has only 140,000 residents of foreign birth; Germany, with 45,000,000, only 270,000; while France, with 37,400,000, has more than a million. In France there has been an increase of 200,000 in the last five years.

Fishing with Otters and Cormorants.

There is probably no known way of fish catching with which the Chinese are not familiar, and there are still some novelties to westerners in this ancient civilization. A very peculiar method is practiced by the natives on the Yungtsze River, opposite Tchang, viz., that of employing the common otter to drag the finny denizens of the muddy deep from their otherwise impregnable retreats under the high, overhanging cliffs.

From a cleft in the rock strong but slender bamboo rods project out over the water, to the extremity of each of which is attached an otter by an iron chain fastened to crossed leather thongs round the animal's chest and immediately behind the shoulders. When resting on the bamboos, curled or doubled up, they look inanimate, and would be taken for dried skins hanging in the sun, but when required for use they are aroused to a great state of activity.

A large net is prepared with leaden weights and so sunk as to cover a considerable space of the bottom, the otter being placed under it before lowering. When once down the slaughter begins, and all unfortunate idlers are nabbed and rendered helpless by the sharp teeth of the savage animal. After a few minutes have passed the whole contrivance is hoisted up, the otter is chained to the rod, and the fish put into baskets.

Some of the otters are not in use, and it is a curious sight to watch them gamboling about as far as the iron chain will allow, splashing and diving and fighting each other.

A prominent English sportsman remarked, upon hearing this account:

"If you were to send it to the *Field*, they would certainly say you 'were a liar,' but it is hoped that the *Angler* will be quite convinced of the veracity of the tale and of the *voracity* of the *otter*."

A daily sight at the long bridge (Bridge of Ten Thousand Ages) over the River Min, at Foo-chow-foo, is the fleet of rafts engaged during the high water period in fishing with the aid of the cormorant, or sea raven (family of *Pelecanidæ*).

The rafts are frail, light structures, composed of five long bamboos lashed together. Only one man can go on each, armed with a paddle, boat hook, and long handled net with a basket for holding the fish. The tide is very strong in the vicinity of the bridge, and the utmost dexterity is required to prevent the slender rafts from overturning, but the fishermen are quite accustomed to being thrown into the water, and so evince no fear.

The cormorants are extremely voracious and are purposely kept in a state of hunger, so that their natural instinct will induce them to dive for their prey. Each raft is provided with two or three birds, and the sport begins.

The birds are apparently very dull and stupid as they crouch down on the raft, and look like a lot of dirty old geese, but once launched into the water they show amazing activity, and prove that their stupidity is only assumed. How they manage to see the fish under water is a mystery, for it is full of mud and of a dirty yellow color; but that there are fish you may quickly find out. The bird darts rapidly under water, is gone about a minute, and brings up a fish in its beak, and then the paddling commences, and after a short chase the pair are hauled in by the net and the game secured. The bird is then rewarded with a tiny fish to satisfy its appetite, and launched again into the foaming current. It is wonderful to see the agility of the boatmen in keeping clear of the bridge piers during this operation; how his swift paddle catches the water and his boat darts in and out across the rips like a live thing, half under water yet floating bravely.

The poor cormorants look drenched enough as they sit waiting to be tumbled in, but they are at home when overboard and never make a miss if once a fish is sighted. A metallic ring around their necks prevents them from swallowing the larger fish, but they get a feed of the small fry on the raft and in an hour or less are not inclined to work, and must have rest till another day. Sometimes two or three of the cormorants will pounce upon one large fish, and the battle that ensues is very exciting. One bird is sure to get it, and then the others follow, trying to wrest it away, the fishermen following swiftly to bag the lot. At such times the interest of the numerous spectators on the bridge increases to shouting, and the birds get ferocious to go in again. A well trained bird will thus capture about twenty large fish in an hour, and the man will gain about a dollar by the sale of them.

The cormorants are captured when young, and are kept in wild, marshy places, fenced in for use when required, on the river. One never tires of watching them at their daily task.—*Junio, in the American Angler.*

Hong Kong, March 27, 1883.

Headwaters of the Arkansas.

The Arkansas River rises in the Tennessee Pass, nearly west of Mount Lincoln, in latitude 39° 21′ and longitude 106° 19′, and flows a little east of south for a distance of about eighty miles in a straight line, when it flexes to the east, and flows through a deep canyon in the granite, and emerges into the plains near Canyon City. Near the junction of the east branch of the Arkansas, the valley, with the terraces on either side, continues pretty regularly about five to eight miles in width, but gradually closes up again below Lake Creek, though on either side are vast deposits of the coarse drift material extending high up on the mountain sides, especially on the west side of the valley. The valley then gradually expands out and enlarges, about five to ten miles in width, for a distance of nearly forty miles.

On either side of the valley small streams flow into the main channel of the Arkansas, from the source to Canyon City. These streams usually have their origin at the very crest or water divide of the two ranges, and, in most instances, have cut their way through the solid mass to the main river. Many of these streams have numerous side branches, which have also carved out wonderful gorges near the crest of the mountains, giving to these mountain ranges a ruggedness that is almost inconceivable to one who has not actually explored them. It is in the study of these gorges that the geologist learns to appreciate the immense results of erosion in giving form to the rocky range of the West. Even yet the power of this force has not been adequately understood, but the wider our range of observation, the greater is our conception of its power. We may safely assert that at some period comparatively modern, 10,000 or 15,000 feet of sedimentary beds extended uninterruptedly from the South Park across the interval now occupied by the Sawatch range, all of which but insignificant remnants have been swept away, while a mass of the granite nucleus, of inconceivable dimensions, has also been removed. The general elevation of the Sawatch range for sixty to eighty miles is 13,000 to 14,000 feet above the sea at this time, and it is highly probable that hundreds and perhaps thousands of feet have been removed from the summit.

In 1845, Fremont, at that time a lieutenant in the Corps of Topographical Engineers, skirted the northern border for a short distance. He came up the Arkansas River, crossed the main divide at Tennessee Pass, and traveled down Eagle River as far as the mouth of the creek. Here he crossed the river and took the trail over to White River, which stream he followed down some distance, then crossed the country to the Green River, thence to Salt Lake City.

The pass was named after General Fremont. The Arkansas River is, next to the Missouri, the largest affluent of the Mississippi. It rises at the west central part of Colorado, and its length is 2,170 miles. It is navigable for steamers 800 miles from its mouth, during nine months of the year.

THE white perch of the Ohio are noted for the musical sounds they make. The sound is much like that produced by a silk thread placed in a window where the wind blows across it.

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Diving for Gold.

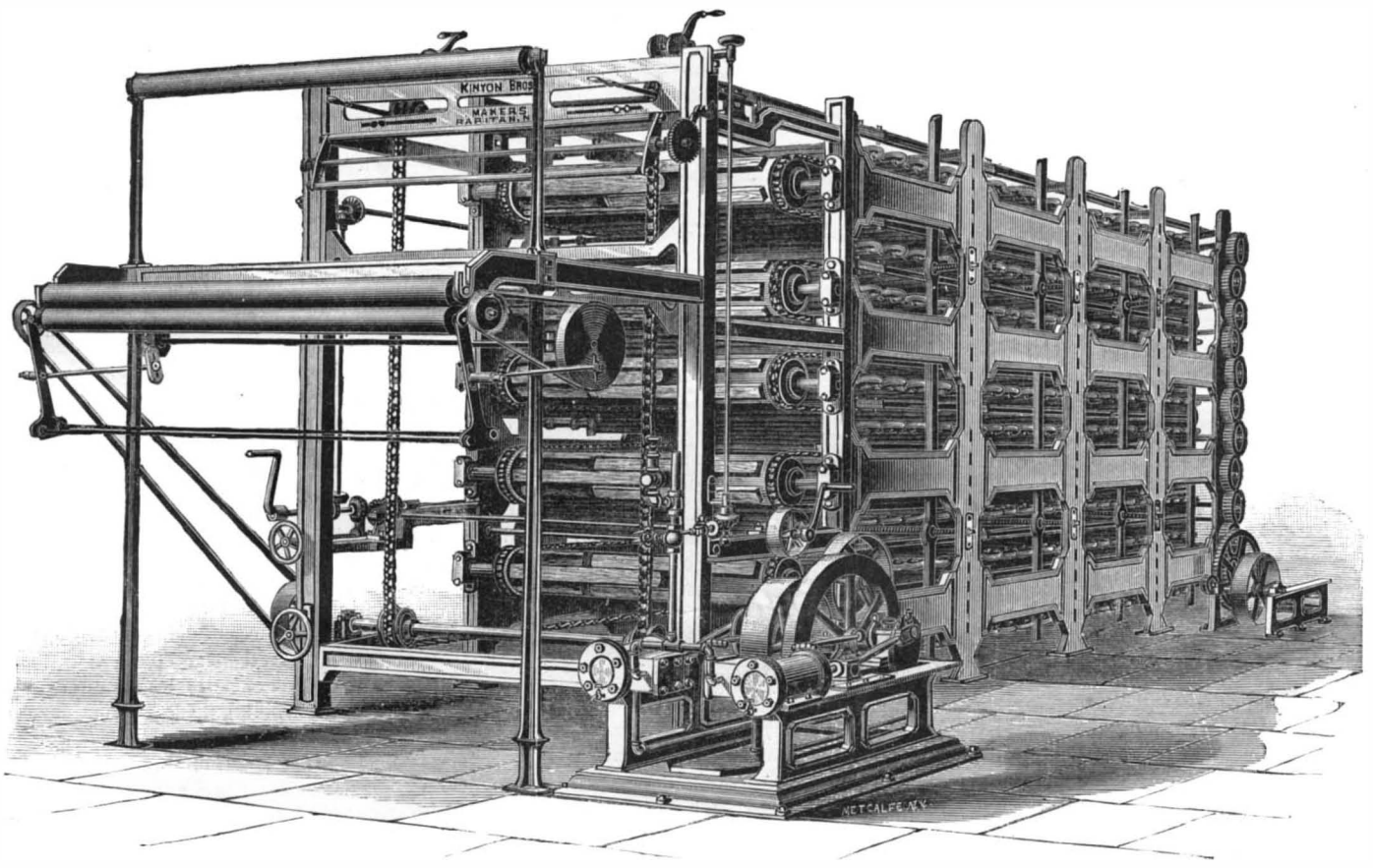
Perfect success has never attended the labors of the gold miner in trying to get gold from the beds of rivers when the water is flowing over the bed. Rivers have been turned aside and wing-dams built, so as to get at the auriferous deposits, and river beds have been worked at low stages of water, but none of these devices for pumping up gold from beneath the river have been successful or practical. Large amounts of money have been expended on dredges and pumps for working river bottoms, and various plans have been adopted. In no case, however, has any money been made out of the operation. Still there are people who contrive to bring up gold from beneath flowing rivers, and make money by it. For instance, in the state of Cauca, Colombia, where there are many deposits of auriferous gravel, most of the small gulches and ravines have been worked out a hundred years ago, though more or less mining is still going on. Many large streams have auriferous beds, and the natives, unable to turn the course of the river, mine in a peculiar way. The women take a batea in their hands, and dive down in ten or fifteen feet of water, scrape the loose sand and gravel into it, and bring it to the surface. Then they climb on to the bank and pan it out. They get from a few cents to four bits a batea. Sometimes the men engage in this work, but it is mainly done by the women. After a dive, the latter sit down on the bank and smoke a while before going down again. They teach the children of twelve to dive for gold also. Sometimes rich pockets or deposits are struck. Nobody but natives engage in this sort of work. At the Saragossa, the Clara Creek, and the Tewee River a good deal of this mining by women diving is done. —*Iron.*

CLOTH DRYING AND TENTERING MACHINE.

The cloth drying and tentering machine shown in our engraving dries goods upon a similar principle to out door drying under the most favorable circumstances, that is, by evaporating the water in the cloth by a soft and even heat, and carrying off the vapor as it is formed. Cloth dried by it has the appearance and feel of cloth dried out of doors, while it is dried much more rapidly, at less expense, and without regard to state of weather. This machine also gradually and very evenly tenters the cloth to width desired, without injury to the fabric, and at the same time will stretch the goods lengthwise if required.

The wet goods are taken into the machine at the top in front, the operator standing upon the elevated platform. Steel tentering pins carried on endless chains at either side, engage the edges of the goods, and the goods are carried in, the chains are made to gradually diverge for a distance of 41 to 16 feet (according to size of machine), until the desired width of goods is obtained, this being under the immediate control of the operator. The goods are then carried twelve times back and forth the entire length of machine, through and among twelve rows of steam pipes, through which steam has a free circulation, producing a uniform heat throughout, and are then passed out dry at the bottom of front of machine, then up to and between a pair of suspended rolls to the folder, which lays them in folds on a table ready to be carried away. A current of air passes through the machine carrying off the vapor. The motive power is furnished by a compact pair of horizontal engines.

This machine is built by Kinyon Brothers, Raritan, N. J.



KINYON'S CLOTH DRYING AND TENTERING MACHINE.

George Gifford.

Mr. George Gifford, a well known patent lawyer, died at his home in Jersey City, N.J., July 2, at the age of 72. Mr. Gifford was for many years counsel for the principal sewing machine manufacturers, serving Howe, Wheeler and Wilson, Grover and Baker, and Singer in that capacity. He made a success of that department of legal practice at a time—twenty-seven years ago—when there were very few of the profession who made mechanics and the subject of the patent laws a special study. Mr. Gifford not only acted as counsel for the united manufacturers under the well known combination, but he was referee and judge between them in their separate capacities, enjoying their full confidence in every position.

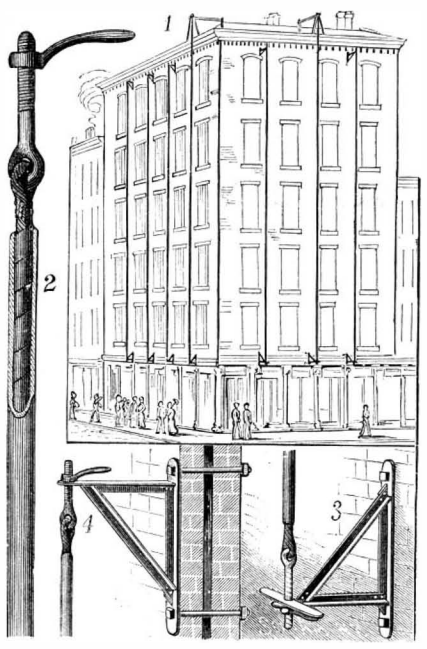
FIRE ESCAPE CABLE.

We give an engraving of a very simple, easily applied and efficient fire escape invented by Mr. A. O. Morford, of Portchester, N. Y.

The fire-escape cable is composed of a rope, preferably of wire, and an outer covering or cushion of soft rubber.

The cable is connected at each end with an eyebolt, as shown in Fig. 2. The eyebolts pass through brackets, Figs. 3 and 4, at the ends of the cable, and the nuts are screwed up tightly, making the cable taut.

In the form of cable shown the outer casing or cushion is a continuous tube of soft rubber drawn snugly upon the cable, but the covering or cushion may be composed of a strip of soft rubber wrapped spirally around the rope, with



MORFORD'S FIRE ESCAPE CABLE.

overlapping edges, which form spiral stop ridges or ribs. Where the edges of the strip of rubber overlap in wrapping the rope, a rubber or other suitable cement is applied to the covering for cementing the layers together, thus forming practically a continuous covering or cushion. In both cases the wrapping or covering of soft rubber will be of such thickness as not only to furnish a protection for the hands in grasping the cable, but a cushion into which the hands will embed themselves with but a slight grip, thus furnishing a firm and safe hold upon the cable with the outlay of but little strength, without cutting, burning, or otherwise injuring the hands, as would be the case with a naked rope.

In the spirally-wrapped form of cable the folds of the strip of rubber also furnish easy hand-grasps, and the ribs or ridges prevent all danger of the hand slipping upon the cable. Besides the advantage of a firm hand-grasp upon the cable, the soft rubber cushion enables the person descending to cling with his limbs to the cable, so as to cause a considerable friction between his clothing and the rubber covering, and thus diminish to a great extent the amount of strength required in the hands to effect a safe and easy descent. This fire escape is very cheap and may be readily applied without defacing the building. Its tensile strength is six tons, and the inventor informs us that sixty persons per minute can descend this escape. Further information may be obtained by addressing the inventor as above.

Rapidity of Cerebral Acts.

M. Albert Rene has, according to the *Revue Scientifique*, made a long series of experiments in the physiological laboratory of the Faculty of Medicine at Nancy on the rapidity of transmission of impulses through nerves, and the rapidity with which cerebral acts are performed. He finds that the intensity of the stimulus has a direct influence on the rapidity of nervous transmission. The stronger the stimulus the more rapid the transmission. The rate of transmission cannot therefore be stated in exact terms, since it is relative, as has been not unfrequently noted for other kinds of cellular activity. He has also confirmed the fact, now very generally admitted, that it is impossible to measure the rapidity of transmission in sensory nerves by stimulating different points of their length, for the rapidity of the response is not proportionate to the length of the nerve traversed. Thus the response to a stimulus applied to the fingers is often made with a shorter interval of time than a stimulus applied to the elbow or to the shoulder, though the length of nerve called into play is much greater in one case than in the other. In a word, it is impossible to compare the results obtained from different regions. The most exact method of measuring nervous transmission appears to be that of response to an auditory stimulus. The rapidity with which nervous impulses are here conducted he estimates at 28 meters per second, which is a little lower than the number obtained by other physiologists. For the rapidity of transmission of motor impulses M. Rene gives twenty meters per second, which is below that of experimenters, and notably below that of M. Chauveau. The duration of a cerebral act he estimates at thirty-five one-thousandths second. In young infants the duration is more considerable, amounting to 0·09 second. The duration of a reflex act—that is to say, the time occupied by the entire reflex arc, sensation, transmission to the cord, including motor impulse, and muscular movement—is 0·15 second.

A New Niagara River Bridge.

The Canada Southern Railroad Company have contracted for a bridge across the Niagara River at a point about 300 feet above the present suspension bridge, to be finished by the first of next December. The bridge will have a clear span of 500 feet between the towers on each bank and will be built of steel. It will be a cantilever truss bridge, wide enough for two tracks, and calculated to sustain the heaviest load that could be placed upon it by continuous trains of loaded freight cars. The cantilever style of bridge has never been used on very large structures, although several bridges of great length are now being constructed on this principle. Each shore section is supported by a tower at nearly its middle, or center of weight, the inner end being anchored and the outer end approaching a corresponding section from the other side. In this instance the projecting sections will be advanced 187½ feet each, making 375 feet together, and the remaining gap of 125 feet will be filled by an ordinary truss bridge resting on the ends of the cantilever spans. The steel towers supporting the cantilevers will be 130 feet high above the stone foundations, which will rise 50 feet above the water. The bridge will be stayed against the force of the wind, as well as supported from the towers, by wire cables.

Dullness in Woolen Manufacture.

From 250 requested replies to questions, received from the proprietors of woolen mills in New England, the Boston *Advertiser* ascertains that 759 sets of cards are stopped, equal to the consumption of 300 pounds of wool each, daily; in the aggregate, 230,700 pounds per day. Probably these returns, which indicate a stoppage of more than one-third of the sets of cards in New England, are incomplete, and do not indicate the extent of the reduction, as no answers have been received from a number of letters of inquiry.

A NEW vegetable parasite, *Haplococcus reticulatus*, has been recently discovered in pork by Dr. Zopf. It occurs in from 30 to 40 per cent of the animals examined. Would it not be well if we paid more attention to the sanitary legislation of Moses, a fragment of the ancient medical law of Egypt?

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Clairvoyance.

Almost every physician, during the course of his professional life, hears stories regarding clairvoyance. Some individual has had a vision or dreamed a dream which is subsequently found to have represented, most marvelously, actual objects or persons that were at the time far away.

An organization in London has been investigating the alleged phenomena of this class, endeavoring to apply scientific methods to their study. The *Nineteenth Century* and the *Fortnightly Review* have at different times published some of the results of this work. Quite recently the latter journal has published an article by Mr. Edmund Gurney and Mr. Frederick W. M. Myers, claiming very positively that the mind may at certain times be capable of receiving impressions through other channels than those of the various senses; in other words, that the so-called *clairvoyance* is an actual physiological fact. As an example of the class of phenomena alleged to be real, we append the following:

"One Sunday night last winter, at 1 A. M., I wished strongly to communicate the idea of my presence to two friends, who resided about three miles from the house where I was staying. When I next saw them, a few days afterward, I expressly refrained from mentioning my experiment; but in the course of conversation one of them said, 'You would not believe what a strange night we spent last Sunday,' and then recounted that both the friends had believed themselves to see my figure standing in their room. The experience was vivid enough to wake them completely, and they both looked at their watches, and found it to be exactly one o'clock.' (One of these friends has supplied independent testimony to this circumstance.)"

We have ventured to furnish our readers this account of the work of these gentlemen because of the strong indorsement that has been given to it, and because of its important physiological and pathological significance. If it could be proved that the mind can perceive through other agencies than the senses, it would establish a fact which would antagonize the present physiological theories (based upon evolution) of the development of these senses; for it is now believed that they were developed in order to enable the animal to adapt himself to his environment. They were made *by* the environment primarily, rather than *for* it, and in the history of animal evolution there are absolutely no data which enable us to account for the development of a supersensual perceptive power.—*Medical Record.*

Decline of Cotton Milling in Scotland.

The remarkable decadence of the cotton manufacturing industry in Scotland teaches an impressive lesson of the results of arbitrary interference with the natural course of trade. Fifty years ago there were 134 cotton mills in Scotland, all doing a lucrative business. In Glasgow and its immediate vicinity 18,000 hands were regularly employed in the cotton mills. Thirty years ago there were 68 cotton spinning mills, with 1,163,575 spindles and 14,057 operatives. Now the number of mills has been reduced to 22, of spindles to 729,000, and of operatives to 3,645. The chief cause for this great falling off may be summed up in the single word, trades-unionism. Between thirty and forty years ago the operatives' trades-union determined to keep the details of the manufacture as much as possible from the employing class, and voted that no son of a master should be initiated into the mechanical mysteries, except by the consent of the majority of the society, ascertained by a secret vote. When permission was obtained, instruction was not allowed to be proceeded with during ordinary hours. These and other obstacles being deliberately maintained, the natural consequences followed. The sons of employers, unable to obtain the training necessary to qualify them to take their father's places, went into other vocations and professions, and, as the heads of the old firms passed away, they left no direct representatives to carry on their work. The mills were managed after a fashion and for a time by second and third parties; but the actual proprietors, handicapped by their ignorance, could not keep abreast of modern invention and competition, and one by one most of them closed their mills. There have been other contributory causes which account in part for the decline, but the first and heaviest blow at the industry, the London *Economist* declares, was the short sighted, selfish, and suicidal action of the operatives' union thirty years ago.

Volumetric Estimation of Phosphoric Acid in Fertilizers.

A. Mollenda says that in superphosphates containing no free acid, the amount of soluble phosphoric acid (acid phosphate of lime) can be estimated from the quantity of carbonate of soda required to form the ordinary bibasic phosphate of soda according to the formula:

$$CaH_4(PO_4)_2 + 2Na_2Co_3 = CaCO_3 + CO_2 + H_2O + 2Na_2HPO_4.$$

If there is any sulphate of lime present in the solution, it will be converted into carbonate and yield a sulphate of soda; hence the lime must first be removed before it is titrated with soda, which may be accomplished with the oxalate of soda. He would digest 100 c. c. of superphosphate solution containing 1 in 50 for 4 hours, with frequent shaking; it is next heated to boiling in a beaker glass, an excess of oxalate of soda added, the oxalate of lime filtered out and washed. To the filtrate and wash water is added some pure litmus tincture, and then titrated boiling hot with one-half normal solution of carbonate of soda; the liquid must remain blue when cold. In titrating a fertilizer made from bone mealf the end color is grayish-green. A semi-normal solution of caustic soda is still better, as the titration can be done in the cold, and it gives accurate results with ammoniacal superphosphates, while with carbonate of soda there is a perceptible difference due to escape of ammonia on heating.

In using caustic soda it is an advantage to employ phenolphthalein or phenacetolin as indicator; and it is unnecessary to filter out the precipitated oxalate of lime, since the milky liquid itself may be titrated directly.

When a superphosphate contains free acid, whether sulphuric or phosphoric, lime water or carbonate of soda is added to the solution drop by drop until a trace of permanent turbidity is visible; then the lime is precipitated and the liquid titrated as in the other cases.—*Chem. Zeit.*

The author does not state whether this method is more accurate than uranium titration; certainly the end reaction will be more easily observed.

A German Insecticide.

The *Repertoire de Pharmacie* quotes, upon the authority of Dr. Nessler, a receipt for an insecticide which is said to have a great reputation among German horticulturists. It consists of soft soap, 4 parts; extract of tobacco, 6 parts; amylic alcohol, 5 parts; methylic alcohol, 20 parts; water to make 1,000 parts. The extract of tobacco is made by boiling together equal parts of roll tobacco and water for half an hour, adding water for what is evaporated. The soft soap is first dissolved in the water with the aid of a gentle heat, and the other ingredients are then added. The mixture requires to be well stirred before it is used, and is applied by means of a brush or a garden syringe fitted with a small rose.

FERN BASKET.

This new form of fern basket is made of the stems of ivy. The stems are bored and threaded, as it were, on stout wire, and are very strong and durable. They have a picturesque

A NEW FERN BASKET.

appearance when hung up, and have the great advantage of not obstructing the light so much as the ordinary flat basket.

Tobacco Juice Vapor for Plants.

The vapor of tobacco juice has been tested in France as an insecticide in green houses with great success. Instead of burning or smoking the tobacco, which is a very offensive process to some persons, the tobacco is made into an extract by soaking or boiling, and the juice is then placed over a chafing dish, a fire, or the flame of an ordinary lamp, and deposited in the greenhouse or conservatory. Delicate plants which are very sensitive to smoke are not injured by this vapor, and it leaves no offensive atmosphere, while it effectually disposes of thrips, lice, scale insects, and slugs. One quart of tobacco juice vaporized in a house containing 350 cubic feet is an ample amount.

The Planet Vulcan.

Although the American and the French astronomers at the Caroline Islands, last May, had fair opportunities for good observations of all the phenomena of the total eclipse of the sun, there were no indications of the existence of the planet Vulcan. The supposed planet was first discovered in 1859, and in 1878 Professor Watson, of Ann Arbor, Michigan, and Professor Swift, of Rochester, New York, both claimed to have seen the planet. But since that time it has not been seen on the occasion of the three total sun eclipses that have occurred. It may be possible that on the two occasions when it was believed to have been seen, it was in such a portion of its orbit as to be favorable to observation, and that similar conditions have not since existed.

THE first cotton mill in California is soon to be built at Oakland. The southern part of the State is regarded as avorable to cotton culture.

Nobel's Dynamite and Explosives Factory.

The dynamite manufactory of Mr. Nobel is located at Ardeer on the Ayrshire coast, and in regard to it the London *Graphic* speaks as follows: The works cover nearly a square mile in area, the buildings being scattered about like the shanties in an embryo American city, large structures and small ones, some of brick, and some of wood, but no two are together. There are about 250 workers in all, women as well as men being employed.

Immediately on passing the policeman at the gate, the workers enter into cottages for the purpose of changing their costumes, and now appear in different colored uniforms, some of the men being clad in bright scarlet, some in blue, but the majority wear clothes of a more somber color. Once the gates close upon them in the morning, the operatives are shut in for the day. Not until night do they resume their ordinary clothes, and pass outward to their homes.

The women are chiefly employed in making the dynamite into cartridges. The place is pervaded by the resolution to minimize the risk of explosion, and, in consequence, not only is every little hut in which the operation is conducted separated from its neighbors, but no more than four women are allowed in each. The distinctive clothing is another precaution, although its use is more obvious in the case of the men than the women. There are grave reasons why the men in red should be separated from the men in blue, and the men in white flannel from either of the other two. The mere cutting up and packing is simple, and comparatively safe, but there are intricate processes connected with the preparation of the explosive portion of the compound, which if not carefully watched are dangerous; and, as the garb he wears is an index to the work he is doing, it is easy to find out a man who strays from his own department into another.

Four policemen from the county police force, paid by the company, are constantly on the watch to prevent dereliction of duty. They speak to no one, and are not to be spoken to. At uncertain intervals, also, there comes into the place a Government official, who sees whether the regulations laid down by Act of Parliament are faithfully adhered to. Each department of the place has an overseer, and over all is a manager, whose wide practical knowledge is such that he can be appealed to on every subject connected with the manufacture.

That it is a profitable undertaking in which the company are engaged is apparent from the high premium on the original shares, and that the product had become a resource of civilization is shown by the demand for it from all parts of the globe, where man, warring with Nature, is uprooting the stumps of trees, leveling the rock that comes between him and a straight path, breaking into the seam of the coal that is to cook his dinner, or making deep and navigable the stream that gives him communication with his neighbor.

A Novel Inclined Railroad.

About one hundred yards below High Bridge, on the east bank of the Harlem River, New York city, is a nearly finished inclined railroad which, although short, presents many features of interest. The road is built up the side of the hill at an inclination of $\frac{48}{100}$, and has a length along the slope of 240 feet. The rails are of maple 3 inches wide by 2½ inches thick, and are spiked to string pieces, running up the track, of yellow pine 8 inches square. These are supported on framework where the ground hollows, and on the surface in other places. The gauge of the road is about 4 feet 5½ inches.

The frame of the car is triangular; the hypothenuse being parallel to the track, thus bringing the floor horizontal. They are 6 feet wide and 7 feet long, with doors in the center of each side; they run on 4 wheels 20 inches in diameter.

The power is furnished by a 50-horse power engine, built by the Lidgerwood Manufacturing Company of this city. The engine has two cylinders 10 by 12 inches. On the crank shaft are two pinions 12 inches in diameter and 8 inches face, engaging with two spur wheels, 7 feet in diameter, keyed on the same shaft. This shaft is of hammered iron, 6½ inches in diameter, and carries, besides the spur wheels, two drums 6 feet in diameter and 3 feet across. The axis of these drums is perpendicular to the line of the track. Around each one will be wound two coils of ⅞ inch iron rope, the winding being in contrary directions, so that one car will be raised while the other is being lowered. The second rope is put on to guard against accident.

The engines have a link motion and automatic brakes, with strap brakes on the drums, which can be run independently. Either of the gears is of sufficient strength to hold the load should the other break. The lever that works the links also operates an ordinary throttle valve between the two cylinders, the arm that moves the valve being connected to the link rocker shaft. By this means steam is admitted to the cylinders slowly, and the engines enabled to start and move steadily at all points of the stroke.

Preparation of Compressed Yeast.

Acording to this patent raw instead of steamed potatoes are used; they are to be pulped and heated with water at 50°, then mixed with green malt and rye husks, heated and allowed to saccharify, cooled, and allowed to ferment at 25°.—*J. Wehmer in Bied. Centr.*, 1883.

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Correspondence.

The Diamond Rattlesnake.

To the Editor of the Scientific American:

In SCIENTIFIC AMERICAN of April 28, page 259, is an article headed "The Diamond Rattlesnake," which must be a fancy yarn. I have lived among them for more than forty years, have known several persons to be bitten by them; never knew but one to die from the bite, although others with whom I was not acquainted have died in the vicinity; have known dogs to die in an hour; have known one other dog to be bitten twice in one week and get well; had a dog bit by a pretty large one, and although his head swelled badly, he found and killed another within an hour, and was well in a week.

I have known many horses and mules to be bitten by them, and not one fourth of them died, although it goes hard with them, as they get bitten about the legs. I would as soon be bitten by one of them as by a copperhead, and they are a much more active snake, as the copperhead is the slowest snake I know.

Inclosed I send you the rattles and fangs of one 3 feet 3 inches long, the first of the season; never saw but two 6 feet long or more. As you will see, the rattles are not perfect, and seldom are here; the old ones get worn off. Will try and send you better one next time. You will see the one side has two fangs, and sometimes there will be three on a side. At this season of the year they are not venomous, and will always try to get out of the way if found where there is no cover; if kept from running, will hide their head under their body and not try to fight, but in a month or so they will stand their ground.

ED. LYON.

Yreka, Siskiyou Co., Cal., June 2, 1883.

[Our correspondent's letter was accompanied by the specimens of rattles and fangs above mentioned, for which we are obliged.—Ed. S. A.]

Carries its Own Moral.

In one of our New England cities, a few days ago, three wretched tramps were brought before the police court as vagrants, having been found in an intoxicated condition in a barn where they had slept the previous night. On examination it was found that each one had been a former resident of the city, and was well known.

One of them had been, only a few years ago, the superintendent of the foundry department of an extensive and widely known manufacturing establishment, receiving a yearly salary of $2,500, and having a pleasant home occupied by wife and children, and being a man once respected and esteemed by those who knew him. The two others had been workmen under him whom he had discharged for neglect of their work for drink, and he himself was finally dismissed for the same fault.

Did not Pay a Profit.

It is a matter of regret to learn that the recent National Exposition of Railway Appliances at Chicago did not pay its managers and promoters; in other words, as stated by the *Age of Steel*, was not a financial success. That paper says that thirty days was too short a time in which to hold an exposition of so much interest and so great a magnitude. Two weeks longer, we are informed, would have sufficed to even up expenses and receipts, but the end of the affair could not be postponed, for the reason that the buildings and grounds were needed for other purposes. The exposition, therefore, had to close at the appointed time. It was simply a miscalculation for which no one can be seriously blamed, and yet on account of which all must feel sincerely sorry.

Plaster Moulds.

The mixtures of fats and fatty oils hitherto in use for coating the moulds in which plaster casts are to be made has this disadvantage, that the fatty acids unite with the lime to form soaps which render the surface of the cast sticky and thus hold the dust, so that in time crusts of dust are formed in the deeper recesses, which are difficult to remove.

According to Puscher, in *Kunst und Gewerbe,* this evil may be overcome by the use of finely divided stearic acid. One part of stearic acid (or the best quality of stearine candle) is melted in a suitable vessel by immersing it in boiling water, and then four or five parts of 95 per cent alcohol are added, in which it dissolves to a clear solution. By shaking the solution as it cools, the acid will be obtained in a very fine state of division, forming a kind of magma with the alcohol. This may be applied to the mould with a brush. In a short time the alcohol will evaporate, leaving the mould covered with a thin film of this finely divided acid, which allows the cast to be readily removed from it, covered with a film of non-adhesive stearate of lime. It can also be employed on elastic moulds, but if the moulds are shellacked, benzine should be used instead of alcohol.

IN boring an artesian well in the Santa Clara Valley, California, the stump of a redwood tree was met at a distance of 281 feet from the ground surface. The point where the tree was struck is 84 feet above tide water, from which it is distant eight miles, and the depth at which the wood was reached is much greater than that of the water in the bay.

New Jersey Crab Farms.

At certain periods all crabs become too large for their shelly covering and are obliged to move out; this is effected by a rupturing of the tissue connecting the upper and lower carapace. The body is first slipped out through this opening, and the crab slowly draws his ten legs out one after the other until the entire animal is free of the old shell. As the winter months approach, the edible or blue crabs (*Callinectes hastatus*) retreat from the shallow waters of our bays, creeks, and harbors, and congregate in immense numbers in deep water, where they settle themselves into the soft bottom preparatory to taking their long winter's sleep. As the cold weather comes on they pass into a semi-dormant condition till the opening of spring. These congregations of crabs are called by fishermen "crab beds." They are taken by means of clam rakes, the handles of which can be lengthened or extended into the water by the addition of sections or "splices." At the rate at which they are now being captured they will soon be as scarce as are lobsters on our immediate coasts, which only a few years ago were so plentiful.

The New Jersey fishermen are more advanced regarding the habits of crabs than any other fishermen that I have ever met, and from them I have obtained some very interesting information. The boats of all well-to-do crabbers consist of flat-bottomed boats or skiffs that can be pushed along in the shallowest of water or dragged over bars and mud banks with great ease. In length, these skiffs vary from 12 to 16 feet, and in width from three to four feet. They are furnished with four wells which are built on to the bottom of the boat, and are readily opened or closed by means of covers. Into these wells a constant supply of water passes through numerous small perforations in the bottom of the wells. For urging the skiff along, the crabber uses the long slender handle of his "seap" or crab net. His position is always at the bow of the skiff, where he stands silent and erect and moves his boat quietly and slowly over the alga-covered bottom, intently watching every object.

We will now go on with the life history of a Jersey blue-crab, and crab vernacular. First is the "hard-shell" crab, which is hardly fit to eat, he being of a watery nature and anything but heavy and plump; but soon, when he strikes a good feeding ground, he will become fat and will be called a "cummer." A "shedder" is a crab that will cast his shell in a few days. Such a crab is quite as valuable as a soft crab, and is carefully placed in one of the wells of the skiff devoted to crabs of his development. Next is the "luster," or a crab that has broken away the tissue that connects the upper and lower carapace, so that the soft crab contained within has become plainly visible in its attempts to burst asunder its upper and lower shell. Such a crab is handled very tenderly, for by to-morrow morning he will be a soft crab and on his way to Market. In from five to seven hours the soft crab has advanced to the stage known as a "buckler" or "leather-back" and "buckram-back." In this stage the soft crab's shell has become tough and of the consistency of thin leather or buckram—hence the name—so that when pressed with the finger it almost seems to crackle, and when the pressure is removed it immediately springs back to its natural position. The lime-hardened crab looks splendid, and the increase in size is something wonderful; the colors are intense and the limbs are clean and shining. In a few weeks this crab will undergo another change and become a "sponge crab;" her "apron" will begin to lift up, and fine strings of minute eggs will be extracted. These will be caught upon numerous curious brush-like appendages which are situated along the abdominal region of the crab and which are covered and protected by the "apron." Millions of these minute eggs will be crowded, parched, and entangled (the eggs are attached to one another on a very fine web like material of the nature of lissus) on the curious appendages, and soon the dull, yellow-colored eggs begin to turn black or very dark, dirty brown; this is a sign that the young crabs are about to emerge from their eggs, and the dark color of the eggs is caused by the development of their black eyes.

When a crabber has fished through a tide, he returns to his marine farm, which consists of numerous water inclosures of wooden stakes which are driven into the sandy bottom of the river, and where the crabs are always well covered with water. Here the "cummers" and hard crabs are confined and are well fed on chopped-up bull-nose clams and winkles. As soon as the lusters become soft crabs, they are packed in shallow wooden boxes with eel grass or "salat," and placed in cool cellars to retard the hardening of the crab's shell, and until the time of shipment arrives. Hundreds of such establishments are to be found at this season of the year along the shores of the bays and rivers of the New Jersey. A. W. R.

American Jade.

The Smithsonian Institution has lately come in possession of a large number of objects made from jade, sent from Louisiana, with a considerable quantity of the unwrought stone. Heretofore it has been impossible to discover the source of the jade ornaments, implements, and charms that have been discovered in ancient American cairns, as no deposit of the stone had been discovered in this country or in Europe. It is believed now that these Louisiana relics will assist in locating the place where this stone exists in this country in quantities.

Advice to Inventors.

More than one prominent manufacturer of electrical and other apparatus have expressed their opinions, based on experience, that inventive efforts do not agree with manufacturing interests; and that, therefore, they have given up experimenting, and devote themselves exclusively to manufacturing to order and for the trade. It is at the present state of manufacturing industry an established fact that, in order to secure financial success, a manufacturer need not be an inventor, and *vice versa*, an inventor does not need to be a manufacturer. Although a man may have the mechanical ability to invent, it by no means follows that he is the best man, or even that he is at all fitted to superintend the manufacture of his own invention, though, perhaps, it may be hard for him to think so, and it may be denying him a great pleasure to have it made by any one else. But the man who may have the experience necessary to the evolution of a new and careful improvement may, and generally does, lack the necessary quality, namely, the experience which begets the knowledge of how to select the best adapted tools and other contrivances, how to obtain and work up the material required, how to superintend the labor, and how to organize and manage a manufacturing establishment so as to turn out good products at the cheapest and most profitable rate. When all these qualities, necessary for those persons who have the immediate charge of manufacturing, are not possessed by the inventor, it is impossible that he should become a financial success. Neither will it, so long as the inventor indulges in the weakness of imagining that if the product of his brains is not manufactured under his own supervision and control, it will not receive the proper construction necessary to its success when placed upon the market. This sort of parental instinct on the inventor's part, the desire to see and lead his offspring through every stage of its career, without escaping for an instant from the wing of his fostering care until it is fully matured and put upon the market on its own responsibility, is but natural, yet it is, nevertheless, a weakness.

In fact, daily experience shows that it is for the interest of the great majority of inventors to keep away from the factory as much as possible, so as to give the factory superintendent an open field. He will not fail, of course, to inspect the character of the work and see that his ideas have been carried out properly. That is his right. But having once made clear what he wants, he should leave the superintendent of the factory unhampered in carrying out his part of the work. The enterprise of manufacturing novel machinery can be divided into three distinct departments, neither of which should conflict with the others. Invention, manufacture, and introduction, each requiring a totally different training, are seldom or never successfully coincident in one single individual. It takes the man of strong imaginative faculties, with a mechanical bent and a practical knowledge of mechanics, to invent; but to manufacture, the man who understands the workshop and the workmen from his own experience with them is necessary; and the business man, who has been trained to knowledge of the methods of trade, is indispensable in placing a new product upon the market. The inventor rarely interferes with the department of the business man, but to the department of manufacture he is a stumbling-block.

It is a blessed circumstance for inventors, says a contemporary, that at the present day, for the construction of any new machine for the market, the ownership of a special plant of machinery is by no means necessary, any more than the actual guidance of the details of the manufacture by the inventor is necessary. There are numerous machine shops with splendid plants of machinery, which will undertake the manufacture. Thus a vast outlay at the outset is unnecessary, and a company can be formed with much less capital. The inventor of a new machine and his associates, by this plan, need trouble themselves but little about the purely manufacturing part of the business. They will easily find those whose business it is to manufacture and relieve them of the work, by running for them a manufacturing outfit that they could not provide for themselves without spending a large sum of money, which it is much better to have in bank, to back up and push the enterprise. Inventors should not lose sight of the fact that the invention of a new machine or device is only the first earnest and most delightful step in what is to be accomplished before an enterprise is fairly afloat. While the business men are hard at work introducing the invention, the inventor must employ his time by watching the product that the business man has to handle, seeing that it is in proper condition, and that the improvements which possibly may suggest themselves to him are applied promptly, so as to keep the mastery of the market, and not to be overreached by other inventive minds.—*The Mechanical World* (*London*).

E. B. TYLOR in *Nature* says that the microscopic examination of the cross section of a single human hair is sufficient to determine to which one of the race divisions of humanity the wearer belongs. If examined microscopically by Pruner's method, it shows circular, or oval, or reniform; its follicle curvature may be estimated by the average diameter of the curls as proposed by Moseley; its coloring matter may be estimated by Sorby's method. There has been even a systematic classification of man published by Dr. W. Muller, of the Novara Expedition, which is primarily arranged according to hair, in straight-haired races, curly-haired races, etc., with a secondary division according to language.

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Plating Metals with Lead.

The method of lead plating depends upon the use of a hydrogen flame for covering the clean surface of metals with lead or some alloy thereof. It owed its origin to the fact that in some printing processes the printed fabrics are run through hot or cold sulphuric acid, and it was found that no metal was sufficiently indifferent to hot and cold acid, with the changes of temperature, for making the necessary rolls of sufficient strength, combined with lightness.

Among many other combinations experimented with was that of covering iron homogeneously and to any desired thickness with lead, and this actually succeeded. The metal to be covered is pickeled and cleansed in dilute sulphuric acid, then rinsed with water, painted over with soldering acid (zinc dissolved in hydrochloric acid), and tinned. Hard lead was then put on the perfectly clean surface, or a good, pure alloy, just as may be preferred, and heated with the hydrogen flame. The surface is then worked over by hand or mechanically.

Rolls made in this way have a clear metallic ring when struck, from which we may conclude that there is an intimate union of the two metals. The structure of the lead coating suffers no change in boiling sulphuric acid of 60° B., and is absolutely tight.—*Polytechniker.*

What Paint Best Protects Iron?

Among the things that require the most protective paint for iron are carriages, farm wagons, plows, and agricultural implements, from which fact it seems feasible that manufacturers of the like ought to be able to give the best information required. Any mineral paint would answer the purpose much better, and I maintain that the paint that most effectually protects iron is red lead. Not in color is it as well suited; but that is only a secondary consideration, and easily overcome by painting it over with any color desired. It contains the following advantages for the preservation of the iron, which is the main object to be gained:

1. Dries easily with raw linseed oil, without an oil-destroying drier.

2. After drying, it remains elastic, giving way both to the extension and contraction of the iron, without causing the paint to crack.

3. It imparts no oxygen to iron, even when constantly exposed to damp—a fact to which all farm wagon makers can testify.

4. It hardens, where it has been spread thickly, without shriveling, forming the toughest and most perfect insoluble combination of all paints. As proof of this assertion, it is used by calico printers for red figure prints, holding out against soap and water; by gas pipe fitters, as the best paint to resist ammonia and tar; by the English iron ship builders, for painting the hulls of iron ships, namely, two coats of red lead and two of zinc white; by wagon and plow makers, for painting wagon gears and plows; by knowing carpenters, for painting wood that comes in contact with damp brick in walls, as it preserves wood from rot, insects, etc.

For those among us who are uninstructed how to mix pure red lead for paint, it should be made known that pure red lead powder, after being slightly pressed down with the finger, shows no lead crystals. When they are visible, it is merely partly converted, and not first quality. It should be ground in pure, old linseed oil, and if possible used up the same day, to prevent it combining with the oil before it is applied, losing in quality. No drier is necessary, as in the course of a few days the oil forms a perfect, hard combination with the lead. American linseed oil is as good as any imported, where the manufacturer has given it age, and not subjected it to heat, as is the custom, by steaming it in a cistern to qualify it quickly for the market. It deteriorates in quality when heated above 160° F. This red lead paint spreads very easily over a surface, and the best of finish can be made with it, even by a novice in painting.—*Louis Matern, in Carriage Monthly.*

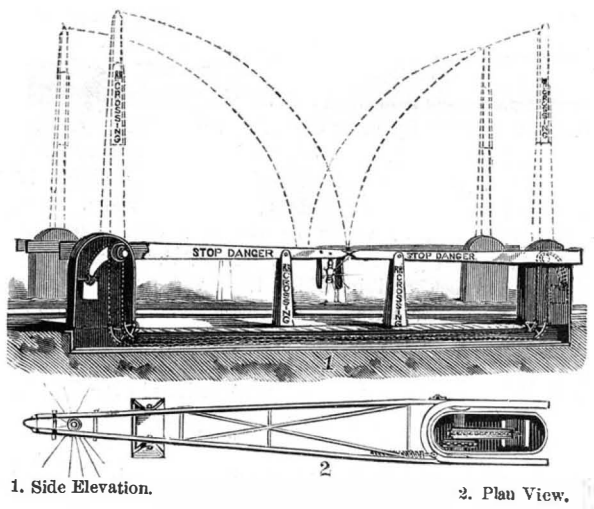
Anti-torpedo Ship.

A singular type of invulnerable war vessel has lately been offered to the notice of the British Admiralty by Sir Edward Reed. He proposes making a convex decked vessel to contain engines and battery, as also men's quarters, stores, magazine, etc., to be supported by a lower portion, which is a cellular boat composed entirely of small air tight and water tight compartments, which will not allow the vessel to sink in consequence of a local injury; and if the lower portion is entirely destroyed by a torpedo the upper portion is expected to become a sea-serviceable raft. The contour of the armored deck is expected to deflect hostile shell and shot, and the under or boat portion is to be only the buoyant means of ready movement; but the upper portion in itself is expected to float if not to readily maneuver, even if the lower portion should be destroyed.

NEW RAILROAD SIGNAL.

A novel and very simple railroad signal and gate is shown in the annexed engravings. By means of this apparatus a train moving along on the track will automatically, by means of pneumatic pressure in suitably arranged pipes, announce its approach to stations or crossings, far in advance both by visible and audible signals, thus informing passengers at stations to be in readiness for the train and notifying travelers on the highway to clear the track.

This apparatus also divides the track into sections or blocks of any desired length, signals being placed at each end of the block, so that a train on entering will automatically move a signal to indicate "danger" to any train following on the same track, until the first train has passed through the "block," and will then actuate a second mechanism, which sets another danger signal and communicates



1. Side Elevation. 2. Plan View.

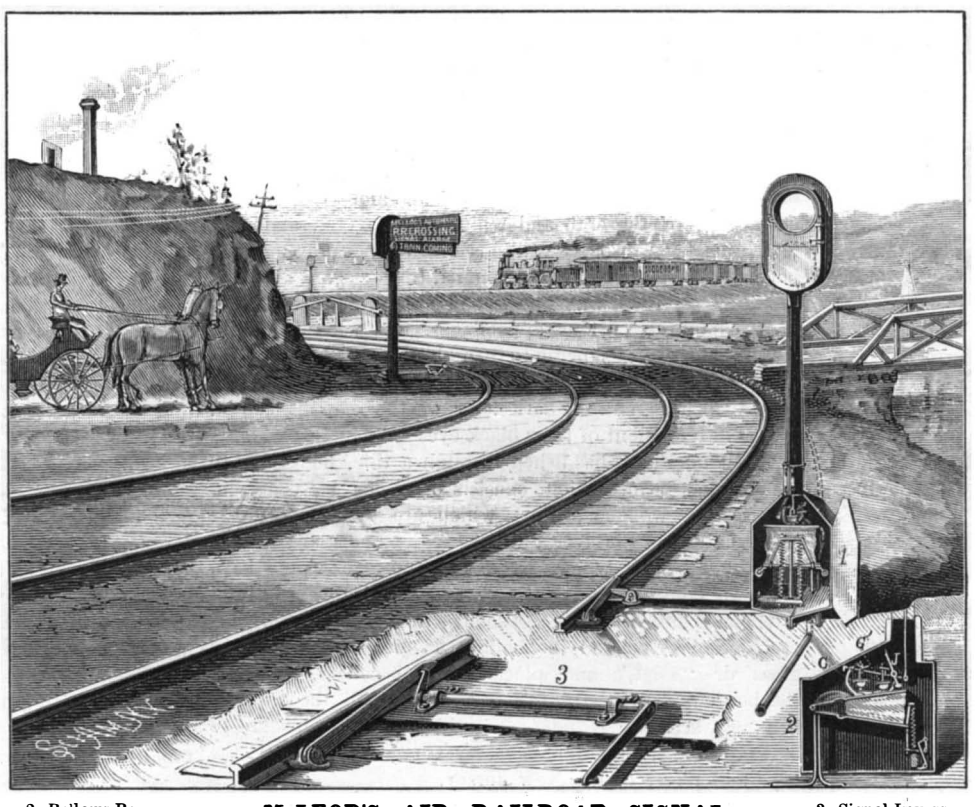
1. Side Elevation. 2. Plan View.

McLEOD'S RAILROAD GATE.

back to the first signal and moves it to indicate "safety;" and it can be arranged to communicate forward by the same mechanism and set an advance signal, and by interlapping them so as to have the train act upon the second or third signal away, and always leave the nearest signal set to indicate danger, any part of the track can in this way be positively and effectually guarded without any additional expense, manual attendance, or electrical appliance.

The inventor also combines with the switch a device whereby an engineer will be informed before reaching the switch whether or not it is in condition for his train to pass. These improvements are calculated to add materially to the safety of railroad travel, and will permit of largely increased travel on the same track, and add greatly to the revenue of railroads.

In operation the tread of the forward car wheel, passing over the incline bar shown at 3, depresses it, and throws up the actuating lever, which, at the bellows, is caught and held up by a catch lever, compressing the spring which yields to that sudden action, and, gradually pressing against the



2. Bellows Box. McLEOD'S AIR RAILROAD SIGNAL. 3. Signal Levers.

movable portion of the bellows, forces the air to the expansion valves and sets the signals. Experiments have shown that in about one second after the actuating lever is held up, the air moves the valve about one-third of a mile away, and in three seconds the gong is sounded and visible signals given, which so continues until the train passes by and stops it. In case of a train stopping before it reaches the signal, it is so arranged as to automatically stop itself in three minutes. The catch lever will hold up the actuating lever until the air is forced from the bellows, the movable portion of which will automatically disengage the levers and allow it to reset in about one minute. Thus the catch lever holds the incline bar below the contact of the following wheels, and also at the signal the lever is so connected with the weight, that when it is wound up it will hold the incline bar below the contact of following wheels until the weight runs down again, thus averting all unnecessary wearing of the signal mechanism.

An automatic crossing gate, devised by the same inventor, shown in Fig. 4, is operated on the same principle as the signal. An air switch signal has also been devised which is attachable to all switches and draw-bridges, so arranged by means of a double air action as to insure its operation, and when the main track is switched to the right, it will display a right hand danger signal about one-quarter of a mile each way, to notify any approaching engineer, and *vice versa*, left hand. It is also applicable for yards and stations, to signal coming and going trains.

All the mechanism of this apparatus is as simple as the striking side of an ordinary clock. We are informed that a man with one blow of his breath through the pipe can set the signals one-third of a mile away. The apparatus works the same in all kinds of weather and by all kinds of trains. We understand it has been tested three winters on the railroad, and has proved entirely successful.

Further information in regard to this apparatus may be obtained by addressing to McLeod Air Railroad Signal Company, 4 Pemberton Square, Boston, Mass.

Horn from Sea Weed.

Under the generic term, "sea weed," the sea beaches offer to use as fertilizers a number of distinct vegetable productions, and two of them, at least, are recognized as materials for food. The *Rhodomenia palmata*, or dulse, is frequently sold on the streets of our seaside cities, taking the place of the school girl's chewing gum, while the *Chondus crispus*, known commercially as "Irish moss," is a favorite for the preparation of jellies and blanc mange. Now, it is claimed, that by experiment the *Zostera marina*, or "wrack," can be made to yield by treatment with mineral acids, a substance resembling horn, capable of being manufactured into forms, and of receiving color from pigments. This substance is called "algin," from *algæ*, the generic name of one common species of sea weed. The crude material can be obtained in large quantities on all exposed shores, and its preparation for ultimate manufacture is a cheap process.

Ambulance Stations for the New York and Brooklyn Bridge.

A frame building eight by twelve feet has been constructed on the river side of each tower of the bridge. In these buildings are placed the telephones, which form a part of a very complete system of communication reaching from one end of the structure to the other. The bridge officials are also providing stretchers to be kept at these stations, so that in cases of sunstroke, fainting, or illness from fits of any kind, the patient may be immediately removed by the officers to the buildings and thus receive the necessary attention. Printed directions for treating cases of sunstroke have been obtained from the New York Board of Health, and medicine will be provided at both termina stations and also at the towers. Superintendent Martin, in speaking of this matter, said: "We do not anticipate many sunstrokes on the bridge, as there is a cool breeze up there a good part of the time, but we want to provide for emergencies."

Yellow Pine.

The prejudices against this material for building purposes and inside finishing are disappearing gradually under the necessity for a substitute for the white pine, which is yearly becoming scarcer and dearer. The *Northwestern Lumberman* says that there has been a current belief in the Northern States that yellow pine will not hold paint satisfactorily. It has been thought that any exudation of pitch would stain the paint, and to a certain extent force it off. This idea, however, has been greatly magnified. In sections of the Southern States, where little besides yellow pine is used for building purposes, there is usually heard but little complaint. Occasionally, a builder will put a coat of alcohol over the outside work, which cuts any pitch there may be on the surface, but oftener no special process is employed. The color of yellow pine when left in its natural state or oiled is bright and enlivening. If its brightness is offensive to some tastes it may be modified and sobered by oil, and it will darken with age. By careful culling of the heart from the outer wood very fine effects in shading may be produced.

SHRINKAGE in lumber varies according to the tree from which it is made. Oaks will shrink in drying a half inch to the foot, while the redwoods of California show no perceptible change, and the heavy Eastern or South American woods lose but little.

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The Dolphin at the Brighton Aquarium.

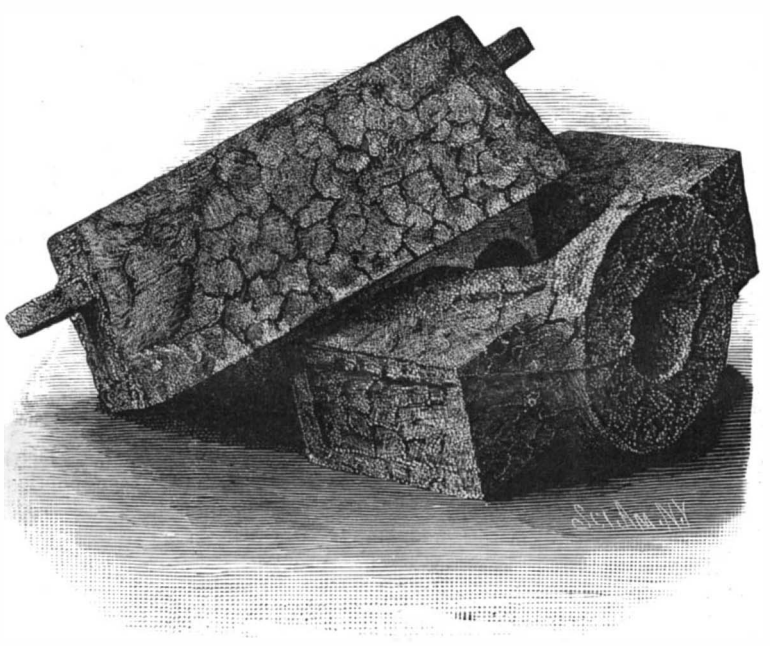
In a letter to the *Brighton Examiner*, Mr. Henry Lee writes as follows: "By the courteous invitation of the authorities of the Brighton Aquarium, I have paid a visit to the dolphin recently placed in one of the large tanks there. It is a full grown specimen of the common dolphin (*Delphinus delphis*), and is about ten feet in length. It was found, early on Saturday morning last, stranded in Selsea Bay, eight miles from any railway station; and by means of much toil, care, and skillful treatment, it was brought safely to Brighton by Mr. Lawler, the curator, after being out of the water for twenty hours. This is the third species of the whales that have been exhibited in this aquarium. The other two have been the common porpoise (*Phocæna communis*) and Risso's grampus (*Grampus riseus*).

The opportunities of observing closely the habits of the cetacea are so rare, and the average duration of their lives in captivity is so brief, that any one who feels interested in the movements, structure, and mode of life of these great sea beasts should not lose a chance of improving his acquaintance with them. In this instance, the difference between this dolphin and the porpoises previously seen in the Brighton tanks should be noted. It is of larger size, weighing about half a ton; its snout, instead of being rounded off like that of the porpoise, is lengthened out in form of a beak, both jaws of which are filled with simple, pinnate teeth; and the dorsal fin rises much higher, and the tail is rather wider across, than in the common porpoise. Those who have not seen one of these creatures under such favorable circumstances, should notice, also, its mode of locomotion. This is effected entirely by an up and down motion of the tail (unlike that of fishes, in which the movement of the tail is from side to side, except in the flat fishes), and the flippers, or "paddles," as they have been called, do not contribute to its progress in any way; they are only used as rudders and poisers. As the water in the tank has been lowered so far as to allow the dolphin to be seen when it rises to the surface of the water, the action of the blow-hole and the absence of all "spouting" should be remarked. In fact, by two minutes' intelligent observation of this interesting animal a grand practical lesson in comparative physiology is to be learned—one a thousand times more impressive than can be obtained from the most careful explanation in print. We have before us a warm-blooded animal of great brain capacity, full of intelligence, breathing atmospheric air by lungs, like ourselves, and the female of which suckles her young one, and attends to it with the greatest maternal affection. This highly organized creature, instead of walking on four legs on land, has to live and move in water; and, so, its shape is adapted to its necessities, and it is made in the external form of a fish. But it has to breathe air through its lungs, and not the oxygen contained in water through gills. If it were to inhale the air in the ordinary way—through its mouth—the water would enter with it, and choke it. To meet this difficulty, its windpipe is carried up to the top of its head, and is fitted with a valve which allows the exhausted air from the lungs to pass out, and fresh air to be drawn in, while it effectually excludes the water.

CURIOUS RESULT OF AN EARTHQUAKE.

The engraving represents the curious effect produced by an earthquake on iron castings poured at the time. The cut, which is about one-sixth the real size of the castings, was taken from a photograph sent us by Mr. F. Gergens, of Yokohama, where the earthquake occurred on June 10, 1883, at 4:30 P. M. Mr. G. attributes the waved surface of the castings to the agitation of the melted iron by the earth vibrations, the waved forms having been fixed by the cooling of the iron.

Two tons of castings made at that time all had the same appearance.



CURIOUS EFFECT PRODUCED ON MELTED IRON BY AN EARTHQUAKE.

Reduction of Ammoniacal Silver Solution by Dextrose.

It is well known that dextrose reduces the alkaline silver solution and deposits the metal in the form of a mirror. The quantity of silver precipitated by a given amount of dextrose has not hitherto been so well known, for where the only object is to get down all the silver, an excess of dextrose was of course employed. If, however, one wishes to utilize this reaction for estimating dextrose, it will be necessary to settle this point. B. Tollens says that since each molecule of sugar reduces 2½ molecules of copper in Fehling's solution, by taking up 2½ atoms of oxygen we should expect it to precipitate 5 or 6 atoms of silver. On the contrary, he found that it reduced at least twice as much. It does, indeed, reduce 12 or 13 atoms and takes up 6 atoms of oxygen; the greater or lesser quantity depending on the excess of silver in solution.

The hypothesis that 12 atoms of silver are reduced by 1 molecule of dextrose gives rise to this equation:

$$C_6H_{12}O_6+O_6=6CH_2O_2,$$

forming formic acid, and in fact a good deal of this acid is produced. The author also detected oxalic acid when there was an excess of silver, which requires 9 atoms of oxygen, reducing 18 of silver.—*Berichte.*

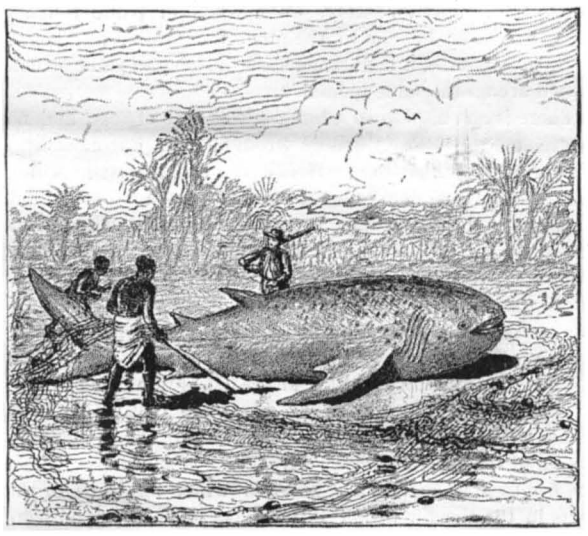
A REMARKABLE SHARK.

To the Editor of the Scientific American:

A perusal of the articles on sharks, appearing in two late numbers of your Export Edition, prompts me to mention a large African shark now in the Colombo Museum, and described per label as follows:

"*Smith's Spotted Shark* (*Rhinodon typicus*, Smith).—An East African shark, never before recorded from Indian Seas. Was caught in a fishing net at Moratuwa, January 5, 1883. Length, 23 feet; girth, 13 ft."

I have verified the above measurements, and can add that the mouth, which (unlike most other sharks') opens on a level with the snout, is 5 feet in circumference, destitute of teeth, but armed with strong cartilaginous bands; and the



EAST AFRICAN SHARK, COLOMBO MUSEUM.

gills, five on a side, behind the shoulders, are each 2 ft. 3 in. long. The color is dark brown, mottled all over the back and sides with spots very like in appearance the mottles on well groomed brown and gray horses.

The monster was, as is set forth above, caught in a net, more properly a seine, called by the Sinhalese *Maha-dthalle* (great net), which, by being run off into the sea a quarter mile or more, then carried along about the same distance parallel with the beach, and again brought to land, incloses many acres of water, at times teeming with fish, which are thus secured in large numbers; and it is a most animating sight, in traveling between Colombo and Kalutara by railroad or coach, to see the thousands of people, men and boys, engaged in this industry, for most of them are nearly amphibious, and while the seine is being laid out the water is alive with dusky human forms, big and small, swimming and disporting about among the fishes they are capturing; and when finally the cast has been made, and the word given to draw in the net, hundreds of willing hands take hold of the long drag ropes, and, to a lively song, march up the beach, drawing in their finny prey.

Ordinarily, a shark of such immense proportions would prove an unwelcome occupant of one of these nets, for he would soon demolish it. Accordingly, the presence of this one inside of their seine must at first have caused the fishermen some perturbation. It seems, however, that he lay nearly motionless on the water, and was easily drawn to the shore, upon reaching which he immediately expired. On examination, its stomach proved to be empty, which fact, together with its great size and easy capture, would indicate that the creature died of extreme old age. It was quite fat, however, and many gallons of oil were tried out of its blubber.

Unlike most fish stories, this one is true; and it also has its sentimental aspect, since the distinguished visitor and subject of it arrived here, probably after an exhausting journey from Africa, simultaneously with Arabi Pasha and his fellow exiles from Egypt, who are now living in Ceylon.

The waters of Ceylon abound in fish of great variety, among which are several members of the shark family, notably the white shark (*Squalus carcharias*), saw fish (*S. trestis*), from 12 to 18 ft. long, hammer head (*Zygæna vulgaris*), tope (*S. galens*), blue shark (*S. glaucus*), basking shark (*S. maximus*), the skin of which is used by the Chinese for making shagreen, monkey mouth shark (*Stegostoma tigrina*), tiger shark (*Galeocredo tigrinus*), mud shark (*Rhyncobates ancytortimus*), and at least two varieties of the sword fish (*Histophorus gladius*), all of which are carnivorous, and most of them used for food by the natives. More especially is this the case with respect to the flesh of young sharks, which is commonly given to women, shortly after confinement, under the supposition, true or false, of its conducing to an abundant supply of lacteal nourishment for the infant.

W. MOREY.

Colombo, Ceylon, March 22, 1883.

Should Women Ride like Men?

The above subject having created considerable discussion in the English newspapers, the *Lancet* (London) now takes it up and concludes that it would be as well to leave the determination of the question to those whom it principally concerns. We fancy they have no wish to change the custom. As a matter of fact, although it may not appear to be the case, the writer continues, the seat which a woman enjoys on a side-saddle is fully as secure, and not nearly as irksome, as that which a man has to maintain, unless he simply balances himself and does not gripe the sides of his horse either with the knee or the side of the leg. It is curious to note the different ways in which the legs of men who pass much time in the saddle are affected. Riding with a straight leg and a long stirrup almost invariably produces what are popularly called knocked-knees. Nearly all the mounted soldiers of the British army suffer from this deformity, as any one who will take the trouble to notice the men of the Life Guards and Blues walking may satisfy himself. On the other hand, riding with a short stirrup produces bowed-legs. Jockeys, grooms, and most hunting men who ride very frequently are more or less bow-legged. The long stirrup rider gripes his horse with the knee, while the short stirrup rider gripes him with the inner side of the leg below the knee. This difference of action explains the difference of result. No deformity necessarily follows the use of the side saddle if the precaution be taken with growing girls to change sides on alternate days, riding on the left side one day and the right on the next. The purpose of this change is to counteract the tendency to lean over to the side opposite that on which the leg is swung.

Losses by Fire.

An exchange thinks it is strange how accustomed people will become to the repeated occurrence of events which, if there were but one in a lifetime, or even in a series of years, would create the most intense excitement. Note, as an instance, adds the *Fireman's Journal*, the destruction of property by fire in this country. Think how many men, how much capital, and how great a share of the intelligent thought of the land are kept constantly employed because of this. Every municipality in the land is constantly agitated over the question of fire extinguishment, every property owner over the question of fire insurance, and every builder and property owner over that of fire prevention.

Each in turn gives employment to a vast number of men whose whole thought is engrossed by this annual wiping out of existence of a portion of the wealth of the land, by no means inconsiderable, whether regarded absolutely, or in its relation to the entire production of the year. Thus, since the 1st of January there has been destroyed by fire in this country, $34,960,727 worth of property, and we may reasonably expect that the final showing for the whole year will not be less than $77,334,500 worth.

Bartholdi, the French Sculptor.

Frederic Auguste Bartholdi, the sculptor, who is completing his immense statue of "Liberty enlightening the World" as a present to this country, is about fifty years old. He was a pupil of the famous Ary Scheffer, and was one of the French commissioners at the centennial exhibition at Philadelphia in 1876. He was so well pleased with his visit here that he decided on carrying out his previous intention as to the great statue, and on his return to France instituted a subscription for the construction of the gigantic figure for New York harbor, volunteering his work. And when subscriptions lagged, he pledged his own private fortune to its completion.

In addition to this statue, M. Bartholdi is engaged on the sculpture of a lion, to be cut out of solid rock, on the face of a mountain at Belfort, France, the figure to be eighty feet long and thirty feet high.

VISITORS find in some of the older houses of Nantucket tall Dutch clocks, with holes in the cases where screws had been taken out. This was done in order to banish wicked ornaments of brass and steel.

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Snake Poisons.

Those who have read the famous Dr. Richard Mead's original essay on the poison of the viper will now read it again by the side of the report of the venom of serpents by Drs. Weir Mitchell and Reichert, of Philadelphia, Pa., to which we briefly drew attention last week. Mead struck the instant attention of the world by the bold, and, as it seemed, wonderful experiment of swallowing the deadly poison of the viper, and escaping unhurt. What led to his experiment is rather obscure, but it was done, and the discovery was thereby made that a physical venom of the most potent kind could be received into the stomach and disposed of there as if it were no more than a harmless food. Mead did more than this. In his day the use of the magnifying glass was just coming into practice, and he, eying the dried poison through such a glass, discovered in it what he very naturally supposed to be fine, needle shaped crystals. He argued about these crystals, and what they did; they were very sharp crystals, and when they got into the blood they pricked and injured, as he thought, the delicate blood-corpuscles, and so caused the death of the blood, and the death also of the owner of the blood—a hypothesis which, in days when the iatro-mathematics held sway, was as ingenious as it was forcible.

Modern readers, perusing the latest researches on physical venom, will see, with curiosity, that Mitchell and Reichert rediscover what Mead called the crystals, and will understand better than the old master why the venom can be so safely swallowed. These latest writers inform us that all the serpent venoms they have examined possess certain common characteristics. In the fresh state, the venoms are in the form of a slightly turbid yellowish fluid, varying more or less in degree of viscidity, odorless, and invariably of acid reaction. In their dried state, they are soluble in water at ordinary temperatures, save for a slight cloudiness, which but slowly settles. Thus dried, they resemble ordinary egg albumen; and when prepared in small quantities in a porcelain capsule, innumerable radiating lines of fracture occur, which break the mass into long needle like pieces closely resembling acicular crystals; indeed, the resemblance is so striking that the uninitiated are frequently deceived as to the true physical condition of the venom. This doubtless was the deception to which Richard Mead was subjected.

In describing the external symptoms produced by the different crude venoms, Mitchell and Reichert observe that such symptoms do not differ radically except in degree. From all alike there is produced some primary heart disturbance, temporarily lowered blood pressure, fatal enfeeblement of the respiratory centers, local effusion of blood, with lessening or loss of its power to clot, and, when the animal subjected to the venom survives some hours or a day, noticeable breaking down of the capillaries, and tendency to putrescence and gangrene. Of the different poisons, cobra venom is the most intense in its poisoning power, that of the copperhead next, then the venoms of the moccasin and the rattlesnake. In the course of their researches these investigators have been led to consider that the serpent venom does not contain an alkaloid, as had been surmised by other inquirers, but that it is in every case made up of three distinct proteid bodies, of which two are soluble in distilled water and one is not. The first of these proteids they declare to be a peptone—*peptic venom;* the second a globulin resembling paraglobulin—*globulin venom;* the third resembling albumen—*albumen venom.* Respecting the active properties of these particular parts, the following is deduced from the experiments related: The peptone venom, which remains uncoagulated by boiling, which will dialyze, and which responds to all the characteristic tests by which its place in the family of proteids is determined, is poisonous, but is far from possessing all the poisonous characters of the compound venomous fluid from which it is derived, being slower in its action, and producing local effects which are œdematous in character and ultimately putrefactive. The venom globulin, on the other hand, is a poison of such virulence that one-twentieth of a grain of it is sufficient to kill a strong pigeon in the course of two hours, and to give rise, within a few minutes after injection, to enormous infiltration of blood into the neighboring tissue. But this venom has no effect on the blood-pressure, in which it differs from the venom peptone, under which that pressure is reduced. The albumen venom is doubtfully poisonous, and, on the whole, the full action of the natural or crude venom as it is produced by the serpent may be considered as represented by the two distinctive parts called by the authors peptone venom and globulin venom.

It is very rare to find in so few pages as have been sent us by Mitchell and Reichert so much new and valuable information. What they have discovered reaches far beyond the direct object of their inquiry, important as that is of itself alone. They lead us by what they have done into new lines of study regarding all the diseases which originate in organic animal poisons. They show to us that certain animal bodies can themselves, by their own vital chemistry, produce at least two organic poisonous substances, and they strengthen the view of those who have dared to think that the same process of self-production of the organic poisons has a range wide enough to account for all those phenomena of disease which, starting from organic virus, pursue a regular course, and in that course reproduce the virus, by modified physiological action, just as the serpent by natural proecss reproduces its venomous secretion.—*London Lancet.*

The Psychology of Panics.

Referring to the Brooklyn Bridge horror, and a more recent similar disaster in England, leads the *Medical Record* to define what a panic is, and to repeat what most persons know in their calm moments to be the remedy. But when the emergency comes, how few withstand the test of their philosophy!

A panic is an acute disease of the brain; it belongs to medicine and to morbid psychology. A genuine panic is an insanity of the mass. The activity of the higher centers is suspended, reason is gone, the whole force of volition is turned in one channel, the whole energy of the emotions is translated into fear of danger and desire for safety. The panic-struck are anæsthetic, insensible to injury, ignorant of any sight or sound, or taste or smell, except such as relate to their effort for safety. Man when in panic touches as near as ever he can to the mental condition of a beast. A runaway horse, a frightened flock of sheep, a panic struck crowd are on the same mental level.

There is no emotion so contagious as that of fear, and no desire so strong, so intimately wrought into our nature, as that of self-preservation. Hence the rapidity with which the psychological contagion of the panic spreads itself. The strongest and bravest man becomes tremulous when in a crowd struck with fear. Panics have their predisposing causes. The mind, when wrought upon by harrowing recitals of previous disasters, or when made unstable from nervous weakness, or insecure by lack of confidence, is most readily affected. For this reason it seems probable that there is at present a widespread predisposition to panics.

The best prophylactic for a panic is the cultivation of a stable nervous system and of the habit of being mentally prepared for contingencies. Every one should know where the fire escapes are in the hotel in which he sleeps, or the exits in the theater which he attends. If each person were to take these precautions, it would certainly make a difference in the number and extent of panics.

No doubt the best thing for the individual to do in case of panic is in most cases to remain still. One cannot stifle emotion, but one can often restrain action, which latter is the thing that does the harm. In incipient panics, loud noises, a confident speech, music, or any distracting object may still affect the mind and check the tide of feeling before it has yet concentrated upon the single purpose of escape.

The class of men who are least affected by and least liable to panics is, the *Medical Record* claims to be, the doctors. We speak from knowledge, the writer adds. We have seen, in a demonstration before a large medical audience, an explosion occur with a flash of flame, burning ether running down and over the table. There was not a cry nor a stir in the whole audience, the fire was put out by throwing cloths over it, and the demonstration went on. We have often witnessed similar accidents on a smaller scale—and the experience is not infrequent—but never have we heard of a party of physicians panic-struck. The reason is easy to see: every medical man is continually called to meet emergencies and to allay panics on a smaller or larger scale. A doctor who has been called to see infants with sudden attacks of croup, children in convulsions, women in hysterical moods, and the various other pathological factors of domestic upheaval, necessarily requires very extraordinary circumstances for the complete disturbance of his own equilibrium.

Decapitation of Insects.

In a current number of the *Rivista Scientifico Industriale,* published at Florence, Dr. Canestrini relates his attempts to determine the duration of vitality maintained by insects after he had cut off their heads, and he gives a table of his results, which contains some curious and surprising statements. He says he found himself at Trentino in the valley of the Non in September, 1882, during the rainy season, when, by reason of the floods everywhere, the insects ascend the plants and trees, and permit themselves to be captured in great numbers. The species of *coleoptera* and *orthoptera* prevailed, and upon single plants surrounded by water he not unfrequently found forty or more specimens of *coleoptera* belonging to different families and genera. He continued his investigations three months, and appears but partially satisfied with his results.

The operation of beheading his unfortunate captives was performed with a very sharp forceps and with razors. It was an easy task in some cases as with the *diptera, hymenoptera, orthoptera,* and very difficult in others. Complete assurance as to the actual death of the insects after decapitation was not always a simple matter to obtain, and when the animal, left alone, had ceased to give any tokens of vitality, it was necessary to apply artificial stimulants, as pressure, pricking, or tobacco smoke, when almost invariably some response came from the motionless creature. The *coleoptera* showed considerable sensitivity, and with them the *orthoptera* and *hymenoptera,* many suffering almost instant death, while other insects seemed almost totally unaffected by it. The *lepidoptera* after decapitation did not seem to be seriously discommoded, and the *diptera* behaved with even greater stoicism. Dr. Canestrini relates the singular fact that a female fly underwent copulation twice after amputation, and that others remained standing upon their legs brushing and cleaning themselves with complete indifference to their condition.

The duration of movements varied extremely in different insects, both in the head and trunk, and some subjects flew after 18 days had elapsed after their mutilation, while the bodies of grasshoppers continued to hop after a period of 18 days, and the praying mantis continued its motions through 14 days. Dr. Canestrini then gives a table in which the length of time during which motions were observed in the trunk and head after decapitation are tabulated for the classes of insects experimented with:

Insects experimented upon.	Duration of movements.	
	The trunk.	The head.
Geotrupes stercorarius	5 days.	16 hours.
Cetonia aurata	9½ "	4 "
Silpha obscura	6 "	12 "
Harpalus	60 hours.	10 "
Butterflies (various species)	18 days.	A few "
Ants (Formica rufa)	30 hour.	30 "
Wasps	5 days.	24 "
Bees	40 hours.	Various hours.
Bombus	30 "	3 hours.
Flies	36 "	6 "
Hornets	27 "	3 "
Mole crickets	9 days.	78 "
Katydids	5 "	80 "
Locusts	8 "	48 hrs. and over
Mantis religiosa	14 "	60 hours.
Pyrrhocaris apterus	4 "	Some hours

From the table death or lifelessness ensues more quickly in the head than in the trunk, but it is remarkable how exquisite the sensitiveness to stimulation is in both these parts in some insects, long after their separation. Thus the katydids will jump and the antennæ and palpi of its head move a long time after decapitation. With other insects quite the reverse was observed. Again, the author remarks that low temperatures conjoined with humidity favored the longevity of his subjects both as to head and body. The moisture seems especially necessary, preserving mobility of the parts, their flexibility and softness, and in consequence aiding their sentience, at least in the cases examined by Dr. Canestrini. The last joints of the legs retain vitality the longest. The influence of moisture was especially striking with the *myriapods,* which under such conditions appeared in some species almost indifferent to this frightful amputation, running hastily away with the anterior extremity of their trunk raised, and persisting in this state of activity for many days.

L. P. G.

Education for Boys.

A new school, supplementary to the ordinary grammar school, and an improvement on the ordinary high school, has been projected, to be located at Lawrenceville, N. J., to be endowed and sustained by the wealth of the late John C. Green, of the above place, a village on the main road between Trenton and Princeton, N. J. The design is to provide accommodations and tuition for boys in imitation of the famous English schools of Eton and Harrow. The architect's designs include a large main building, a chapel, five masters' houses, the head master's house, a central dormitory, and a gymnasium, together with bath, steam, gas, and play houses, and a laundry. These accommodations are intended for a school of 200 or 300 boys. Mr. Frederick Law Olmsted has been employed to take charge of the landscape gardening.

The amount of the fund devised by the founder is not only sufficient to provide for all the initial equipments, but will include aid to indigent students, while those of tried scholarship and character will have their tuition remitted. About thirty of the most promising students also will receive annual scholarships, sufficient, with economy, to maintain them in their studies. Each one of five assistant masters will have a cottage on the grounds large enough for the accommodation of his family and of twenty pupils. By this scheme of boarding the home life of the boys will be continued, and the usual practice of herding great numbers in dormitories, under the supervision of tutors, will be done away with.

Analyses of American Barleys.

The following analyses, by Schwartz, have been published, and they tend to show that American barley is richer in starch, and therefore in extract, than European barley:

	Maximum.	Minimum.	Mean of a number of analyses.
Moisture	16·96	10·46	13·71
Starch	68·33	63·77	66 05
Albuminoids	13·58	9·23	11·41
Ash	3·74	2·72	3·23
Phosphoric acid	1·050	0 850	0 953

The percentages of starch, albuminoids, ash, and phosphoric acid are calculated on the perfectly dry barleys. We also give the comparative analyses of American and European barleys by the same authority:

	American.	European.
Moisture	13·71	15·11
Starch	66·05	64·14
Albuminoids	11·41	11·21
Ash	3·23	—
Phosphoric acid	0·953	0·995

Fall of the Bowlder.

"The big bowlder" that has been so great an attraction to visitors to the "Flume," at Franconia Notch, New Hampshire, has fallen from its position, where it had been held high above the turbulent stream, gripped between the rocky walls of the gorge like a pebble between the jaws of a vice. It will be a serious loss to the attractions of that singular rock wall formation known as the Flume, the upper or northern part of which has just undergone other remarkable changes caused by the moving of rocks by June floods.

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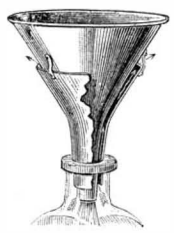
RECENT INVENTIONS

Improved Funnel.

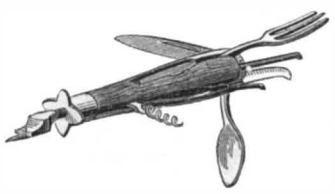
This funnel is of the class in which provision is made for the escape of air from the vessel which is being filled. The liquid funnel is surrounded by an air funnel, leaving an intermediate space for the escape of air. These funnels are held in such local relation that ribs are rendered unnecessary in either funnel. Connecting pieces are riveted at their lower ends to the top of the outer funnel, and at their upper ends to the outside of the inner funnel. This keeps always clear and unobstructed the intermediate space, and also supports the liquid funnel above and upon the air funnel.



This useful invention has been patented by Mr. Harry E. Gifford, of New Bedford, Mass., who may be addressed for further information.

Combination Can Opener.

This tool combines a can opener, knife, fork, spoon, tweezers, wire cutter, toothpick, and corkscrew. The can opener at the small end of the handle consists of four blades and an adjustable point forming the fulcrum and center for opening blades. To the larger end of the handle are pivoted the knife, fork, spoon, and wire cutter, all adapted to fold down into recesses formed in the handle. A corkscrew is similarly pivoted at the middle of the handle, and at the larger end are recesses containing tweezers and a toothpick. When all of the parts attached to the handle are folded down against it and shoved down into it, their outer surfaces stand about flush with the main body of the handle, so that they in no way interfere with the use of the tool in opening cans, and any one of them may be turned or drawn out for use as occasion may require. The device is very complete and compact, and is convenient for travelers, excursionists, surveying, prospecting, and hunting parties. This invention has been patented by Mr. Henry Hartman, of Salt Lake City, Utah Territory.



Why Cochineal and Carmine are so Costly.

The *Ironmonger*, London, explains why the beautiful cochineal and carmine colors are so expensive. It says: One of the best and most powerful animal dyes used in the arts and manufactures is the body of the female cochineal insect, dried. This insect exists on a species of cactus, and when alive is about the size of a ladybird, or perhaps a trifle smaller. It is wingless, rather long, equally broad all over, and is marked behind with deep incisions and wrinkles. It has six feet, which curiously enough are only of use directly after birth, and secures itself to the plant by means of a trunk which is found between the fore feet, and derives its nourishment from the sap. The male cochineal is like the female only during the larva period. It changes into chrysalis, and eventually appears as red flies. The female deposits some thousands of eggs, which she protects under her body until they are hatched, and on the appearance of the young ones the parent dies. While the young are in the larva state their sex cannot be determined. They lose their skins several times, and while the female fixes herself on the plant, the male, after getting over the pupa state, is winged. Two or three months is the extent of the life of these little insects. They are gathered before they lay eggs, and are then rich in coloring matter.

Carmine is prepared from the cochineal insect, the *Coccus acti*, which is collected by brushing the branches of the cactus with the tail of a squirrel or other animal; this is very tedious work. They are killed by immersing them in boiling water, and this has to be done at once or they would lay their eggs, and thereby lose much of their value. There are many processes for preparing the carmine. The French process may be taken as an example: one pound of the powdered cochineal insects is boiled for fifteen minutes in three gallons of water; one ounce of cream of tartar is then added, and the boiling continued ten minutes longer; then one ounce and a half of powdered alum is thrown in, and the boiling continued for two minutes longer. The liquid is then poured off, and set aside for the carmine to settle down. In other processes carbonate of soda or potash is used.

Imperishable Flowers.

There were recently exhibited, by Sir Joseph Hooker, at a meeting of the Royal Society, some leaves and petals of flowers and some twigs and mosses which were removed from the tomb of the founder of the eighteenth dynasty of Egypt, who died 3,500 years ago. The vegetable remains were treated in warm water until they sufficiently expanded to allow a determination of their species and in most instances an identification sufficiently close to allow them to be classified. And, as an evidence of the stability of vegetable types, the mummy flowers plants were the same as those now existing. The blue water lily, *Nympha cerulea*, the white water lily, *Nympha lotus*, the willow, *Salixsafaf*, seeds of the *Juniperas phœnicea*, and several grasses, together with lichen indigenous to Greece, were found and identified.

The Great Discoveries in Electricity.

We extract the following few interesting passages, in regard to the rapid progress made in electrical science, from a learned discourse pronounced on the 16th of December last, by Prof. Ch. Montigny, on the "Great Discoveries made in Physics since the End of the Eighteenth Century":

"Franklin was asked, precisely a hundred years ago, what ought to be thought of the balloons that the brothers Montgolfier had just invented. 'Can you foresee,' he answered, 'what will become of the child that has just been born?' This wise answer tells us that at the birth of a discovery we are unable to prejudge the extent of the benefits that it has in reserve for us. Had any one foreseen, a few years after this answer, the importance that the invention of Volta's pile was going to acquire?

"This discovery of the finest instrument of modern physics, which marked the last year of the eighteenth century, was brought about by circumstances which, although generally known, it is proper to recall briefly in this place.

"Galvani, a professor of anatomy at Bologna, discovered in 1786 that the hind members of a frog, freshly prepared, underwent a contraction when a metallic arc established a communication between the muscles and lumbar nerves of the animal. Struck by so singular a fact, Galvani studied it with all that sagacity with which he was endowed. In order to explain the phenomenon, which caused great sensation in the scientific world, he supposed the existence, in the nerves, of an animal electricity, or vital fluid, and presumed, in likening its action to that of the electricity of the Leyden jar, that, on passing from a nerve into a muscle through the metallic arc, this fluid caused the contractions of the animal. This explanation was generally accepted.

"Volta, a professor of physics at Pavia, who had already signalized himself by remarkable discoveries concerning electricity, did not long share the ideas of Galvani. He called the attention of physicists to the metallic arc which put the nerves in connection with the muscles, and attributed the effects observed, not to the action of a peculiar fluid, but to the special action of an electric current that the contact of heterogeneous substances called forth. In support of his opinion, he established particularly this fact, which had been remarked by Galvani himself, that the contractions of the frog's legs were much more marked when the communicating arc was formed of two different metals.

"Then began a memorable contest, one of the most fecund that the history of science presents, between Galvani and Volta. Although the existence of electric currents in living animals was afterward ascertained, Volta came out victorious from this contest, in which he covered himself with immortal glory by the invention of the pile in 1800—scarcely a year after Galvani's death. Volta was led to this discovery in the following way: He found, in the first place, by means of the condensing electrometer—an extremely sensitive instrument that he had previously invented—that two disks, one of copper and the other of zinc, became electrified, the former negatively, and the latter positively. These effects being due exclusively to contact, according to him, he imagined that he should increase their intensity by multiplying the number of couples formed by each of the two metals, and by superposing them each in the same order. But these attempts remained fruitless until the idea occurred to him to separate each couple by a good non-metallic conductor, such as moist paper. He at once found that in two couples separated in this way the intensity of the electric couple was immediately doubled. This important fact recognized, nothing was more simple than to superpose a certain number of couples of two metals arranged in the same order, and to separate them in the same way. This was what Volta did, and he found that his apparatus was much more energetic when the disks of paper or cloth that separated the couples were wetted with salt water.

"Such is the succession of the principal facts which led to the invention of the pile—'the most marvelous instrument,' says Arago, 'that man ever invented, not excepting either the telescope or the steam engine.'

"Volta made his discovery known to Sir Joseph Banks, President of the Royal Society of London, in a letter dated at Como, March 20, 1800, and in another to La Metherie, a French savant.

"The importance of Volta's invention was at once appreciated, and great honors were bestowed upon him, particularly by Bonaparte, who invited him, in 1801, to come to Paris, and who eagerly assisted at the meeting of the Academy at which the man of genius repeated the experiments that had been the starting point of his admirable invention.

"The discoveries of the decomposition of water, salts, and alkalies were made by means of the electricity of the pile, and were accomplished with single liquid piles, which present the grave inconvenience of giving currents whose intensity rapidly decreases. We must not forget that it was Becquerel, senior, who established the principles upon which is based the arrangement of constant-current piles, or those employing two liquids, and that it was in 1829 that he made known the first element of this kind. A few years afterward, in 1836, the English physicist, Daniell, invented the couple which bears his name, and which became a very practical apparatus. This invention obtained for its author the Copley medal. It is the predecessor of all those different kinds of elements in so extensive use at present, and that are applied in telegraphy, electro-metallurgy, and in a multitude of works that have made the pile as common an instrument in shops as it is valuable in laboratories.

"The letter from Volta to Banks which figures in the 'Philosophical Transactions' (1800) is very lengthy, and is written in French. In it Volta describes, under the name of 'electromotive apparatus,' the columnar instrument, and the 'Couronne des tasses.'

"The name of 'pile' given to Volta's apparatus soon prevailed, because the couples of the two metals are *piled* up vertically in the columnar form of the apparatus. Volta's invention is described in the *Journal de Chimie et de Physique*, under the name of 'electric pile' (vol. i., 1801).

"The letter to La Metherie figures in the *Journal de Physique* of that savant (1801).

"Volta was born at Como, on the 18th of February, 1745, and died there March 5, 1827. His fellow citizens and his admirers have erected a beautiful monument to his memory over the spot where he is buried, and a statue on one of the principal squares of the city.

"The city of Bologna also has had the honor of erecting a statue to Galvani, who immortalized his name by his great discovery. He died on the 4th of December, 1798 (one year before the invention of the pile), at Bologna, where he was born on the 9th of September, 1737.

"When Volta came to Paris, Bonaparte, who was a member of the Classe des Sciences de l'Institut, proposed that the Classe should decree to the visitor a gold medal for his invention. The proposition was unanimously carried. The following year, the First Consul, who had presented Volta with a special gift from the State funds, created two prizes—one of 3,000 francs, for the best experiment made during the course of each year on the electric fluid, and the other of 60,000 francs, 'for the person who, through his experiments and discoveries, should advance electricity and galvanism as much as Franklin and Volta had.' Foreigners of all nations were admitted to the competition. The prizes were successively decreed to Erman, of Berlin, in 1806, to Davy, in 1807, and then to Gay-Lussac and Thenard in 1809.

"Napoleon the Third having in 1852 instituted a prize of 50,000 francs in favor of the author of the most useful applications of the Volta pile, the money, after several competitions without result, was accorded in 1863 to Ruhmkorff for the invention of his induction coil.

"The foundation of the Volta prize having been maintained, it was decreed, in 1880, to Graham Bell, of Boston, for the invention of the telephone.

"During the same year in which Volta announced his invention in England, Carlisle and Nicholson decomposed water by means of it. Soon afterward Cruikshank, who gave it the form of the trough, decomposed some salts, and W. Henry some acids. But it was the remarkable labors of Berzelius and Hisinger, in 1803, which, at this epoch, solved the question of the decomposition of salts by the pile, by showing the law of the carriage of their elements to the electrodes. Davy made a still quicker leap toward the application of the pile to chemical decompositions, by isolating, in 1807, by the aid of a powerful pile, potassium, sodium, and other metals. Bear in mind that we owe to this illustrious chemist the first experiment on the electric light, this having been realized in 1813 by passing, *in vacuo*, a very strong current between two points of calcined charcoal placed very close together.

"It was Faraday, who later on, toward 1832, established the laws of electrolysis of decompositions by currents.

"Berzelius, the celebrated Swedish chemist, was born on the 20th of August, 1779, and died on the 7th of August, 1848, at Stockholm.

"Davy was born at Penzance (Cornwall) on the 17th of December, 1778, and died at Geneva, on the 28th of May, 1829."—*L'Electricite.*

Gold from Peruvian Rivers.

The whole of the Chucamba (Peru), says a correspondent in *Iron*, for a number of leagues above and below the Temple of the Sun is auriferous, and the inhabitants of the province of Huamelies, through which it passes, obtain by washing the sand, and by means of sheepskins, 200,000 or 300,000 dollars' worth of gold annually. The wool on the skin is cut out until it is about half an inch in length. The skins are then anchored down, with the wool side up, by means of loose stones placed on them, in and below the various rapids, in which position they are suffered to remain from six to twenty-four hours. They are then carefully raised out of the water, turned wool side downward into a batea (tub) of water, and thoroughly washed; the gold falling from the wool of the skin is finally collected from the bottom of the batea. Sheep were unknown to the Incas, and as they had obtained an immense amount of gold from this Pactolean stream, it is presumed that they used the skins of the llama (*Camelus lacina* of Linnæus) and those of the vicuna (*Camelus peruanus*, or *vicuyna*, of Linnæus)." The above will not only be of interest to the general reader, but will also furnish a wrinkle to gold miners similarly situated.

ENTHUSIASM is one of the most powerful engines of success. When you do a thing, do it with a vim. Do it with your might. Put your whole soul into it. Stamp it with your own personality. Be active, be energetic, be enthusiastic and faithful, and you will accomplish your object. Truly has Emerson said: "Nothing great was ever achieved without enthusiasm."

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ENGINEERING INVENTIONS.

Mr. E. C. Galentine, of Bourbon, Ind., has recently patented an automatic car coupling, in which a gravity hook is adapted to be lifted by the impact of the link. The simplicity of the invention should recommend it to railroad men.

An improved door and door attachment for grain cars has been patented by Mr. Charles C. Duffy, of Newport News, Va. The inner doors of grain cars are so hung that they are pressed open by the lateral pressure of the grain when the cars are to be unloaded, thus facilitating the discharging operation.

Messrs. Samuel H. Scott and George J. Talmage, of Chanute, Kas., have recently patented an improved car coupling which consists in a drawhead carrying a swinging link, and adapted to receive the link of an opposite head, and in devices for holding and uncoupling the link and for operating the swinging link from the top or the side of a car, to obviate danger to the life or limbs of the operator.

Mr. James E. Sinclair, of Baltimore Co., Md., is the patentee of an improved valve which is designed mainly for pumping or hydraulic purposes, but is applicable to all uses in which a check valve may be employed. It belongs to that class of valves in which an elastic or flexible tube is secured at one end to a circular shell or ring, while its other end is collapsed or flattened, which tube will allow fluids to pass in one direction, but acts as a check for the reverse flow.

A patent has recently been issued to Mr. J. E Sinclair, of Baltimore County, Md., for a superheating steam engine, in which the steam is reheated after it leaves the boiler, and its expansive force thus greatly increased. Heretofore separate superheating chambers interposed between the boiler and cylinder have been used. The present invention dispenses with separate superheating chambers and superheats the steam in the cylinder in which it is used.

An improved station indicator has been patented by Mr. G. F. Robertson, of Taylorsville, Ky. The mechanism consists in a case containing endless chains upon which are attached slats bearing the names of the stations upon the line of travel. One of the rollers is provided with a pawl and ratchet, by means of which the rollers may be rotated and the several names of the stations brought to the view of the passengers in the opening in the case.

Mr. James Barrett, of Beallsville, O., has obtained a patent for a car coupling which is an improvement upon a patent granted to same inventor June 20, 1882. This invention consists in the employment of a coupling pin pivoted in the upper forward end of the drawhead and inclining downward and backward into the throat of the drawhead, the pin being suitably notched for engaging with the connecting link.

An improved gold washing apparatus has been patented by Messrs. Charles S. Betts and H. E. Wilson, of Salt Lake City, Utah Ter. The gold bearing material is washed from the flume upon a screen where the gravel, dirt, and lighter materials are carried over the screen and discharged. The heavy screenings are caught upon a platform, from whence they pass on to a series of mats which serve to catch and retain the gold, after which the mats are washed out in tanks and the gold secured.

Mr. Charles C. Duffy, of Newport News, Va., has recently obtained a patent for an improved dumping car for use in constructing railroads and for other purposes where earth is to be transferred from one point to another. The car is provided with a series of chutes of varying capacity, located on either side of the car. A rod extends the entire length of the car for opening the doors of all the chutes at one operation. The doors are secured by spring bolts, and between the latter fastenings and the rod are connecting chains.

An improved car coupling has been patented by Mr. Charles E. Appell, of Harrisburg, Tex. The invention consists in the combination with a drawhead of an L-shaped lever pivoted in the same and provided at its angle with a lug, which lever has a coupling pin suspended from the end of the long arm, and has its short arm passed into an aperture in the inner end of a bar sliding in the bottom of the drawhead, whereby when the lug is depressed the coupling pin will be raised and the bar in the drawhead will push the link out from the end of the drawhead.

Mr. William Emmett, of Logansport, Ind., is the patentee of an improved car coupling. The drawhead is provided with a coupling hook which slides vertically within the drawhead, and it has a hook at its upper end. Both these hooks are beveled at their forward edges to admit of the ready entrance of the coupling link. A crank shaft is connected with the coupling hook and at the end with a shaft which reaches up to the top of the car, and is joined there with a horizontal rod which extends along the side of the car, and communicates with the tender of the locomotive, whereby the raising of the hooks couples the car, and may be effected either in the car itself or from the locomotive.

A direct acting steam pump in which the water and steam cylinders are arranged both within the case, has been patented by Mr. James E. Sinclair, of Baltimore County, Md. An outer cylindrical case has a central ring containing steam ports and packing ring, combined with a shell of smaller diameter arranged concentrically therein, and provided with open ends and a valve, and having at its ends flanges that form annular piston heads, which fit with a tight sliding joint in the outer cylinder, by which construction steam is admitted to the annular spaces between the inner shell and outer case or cylinder, alternately on opposite sides of the central ring, causing the inner shell to reciprocate, and the water to flow straight through the center.

MECHANICAL INVENTIONS.

Mr. James M. Bryan, of Guthrie, Ky., is the patentee of a fishing reel which is so constructed that the fish, when hooked, is drawn in by the line, which is wound upon the spool of the reel automatically without any effort on the part of the fisherman.

An attachment to windows for allowing flies and insects to escape from a room, and to improve the ventilation, has been patented by Mr. Milton L. Edmunds, of Danbury, Iowa. This invention consists in a valve of circular form with a groove cut in the side, which valve is located over the panes of glass, and so arranged that the aperture over the panes may be left open or closed by rotating the valve appliance.

A novel apparatus for filling target balls has been patented by Messrs. Pierre J Jarre and Etienne A. Jarre, of Paris, France. The object of this invention is to provide a machine which will fill rubber balls partly with air and partly with water, and will so regulate the proportion between these two that the balls will be of suitable weight relatively to their size for projection into the air, and further the machine is provided with a device for clamping and hermetically sealing the mouths of the balls after they have been filled.

A very simple device for ascertaining and regulating the inclination of the spindles at the end of an axle to correspond with the bevel of the wheel has been patented by Mr. William Buckeridge, of Port Huron, Mich. To the supporting standards at one end is arranged a metallic square which is adjustable by means of set screws, and is provided with a plumb line for regulating the placing of the same. In securing the set of the spindle of the axle the bevel of the wheel is first ascertained, and then the long arm of the square is moved a corresponding distance out of plumb line, so that the short arm will indicate the desired inclination of the spindle of the axle.

An improved windmill which is self-regulating according to the force of the wind has been patented by Mr. W. C. Sickles, of Dallas, Texas. The shaft of the wheel is provided with two collars, one of which is loose and the other fixed. A spiral spring which surrounds the shaft is placed between the two collars, and to the peripheries of these are flexibly connected a series of blades which are arranged in such a way as to oscillate toward a feathering position in a strong wind. In this way when the wind is strong the blades will assume a feathered position, and will present very little surface to the wind, while if the wind is low the wings will resume their normal position, and in both cases the same speed will be approximately attained by the wheel. The same principle with modified construction may be applied to water wheels.

An automatic brake for hoisting machines has been patented by Mr. William W. Wythe, of Red Bank, N. J. The object of the invention is to provide a brake mechanism for pulleys, derricks, and other hoisting machines which shall be brought into operation automatically by the weight of the load, but will be released by the movement of the operating shaft when power is applied for raising or lowering the weight. The same inventor has also obtained a patent for an improved mechanism for raising heavy weights, which mechanism is so constructed that the loss of power by friction is reduced to a minimum, the whole being operated by means of a hand wheel and rope, or by a crank handle, and further, with this construction a wheel of much smaller size may be used for elevating the same weight than would be possible with a hoisting apparatus of the ordinary gearing.

AGRICULTURAL INVENTIONS.

An improved mowing and reaping machine which is very simple in operation, economical in use, and is readily adjustable as to the height of its cutter bar has been patented by Mr. Isaac Branch, of Adairsville, Ga. The shear blades in this machine are caused to oscillate upon individual pivots, by means of a scalloped wheel on the main axle of the machine acting through several levers.

Mr. Hiram L. P. Pool, of New Edinburgh, Ark., is the patentee of a combined scraper, plow, and cultivator. This implement consists in a beam provided with adjustable handles and with adjustable standards, the first and last being provided with plows and the intermediate one with a scraper. The plow standards are secured to the beam by bolts, and the distance laterally between the three standards may be regulated for adapting the machine to various uses.

MISCELLANEOUS INVENTIONS.

Mr. E. M. Senseney, of St. Louis, Mo., has secured a patent recently for a bicycle bell having a simple clapper, by which contrivance the bell may be sounded without any effort on the part of the rider.

An ornamental rod attached to the pole or shaft of a wagon for supporting the reins and to prevent horses from getting their tails over the latter has been patented by Mr. David McGladery, of Havilandsville, Ky.

A toy pistol, so constructed that caps may be exploded and marbles shot off simultaneously, has recently been patented by Mr. O. C. Butterweck, of St. Louis, Mo. This invention is an improvement upon a patent granted to same inventor Feb. 29, 1876.

Mr. C. E. Goss, of Lynn, Mass., has patented an attachment for shoe lasts, the object of which is to hold the block and insole in place when lasting shoes, which the inventor claims that it does in a firm and efficient manner.

Mr. N. C. Cookson, of Newcastle upon Tyne, England, has patented an improved electrode for secondary batteries, which consists in combining a folded layer of fine leaden wire with a perforated leaden sheet having a tongue, so that the tongue and wire end will be brought together and form a pole.

Mr. Oren Rubarts, of Albany, Oregon, has obtained a patent for an improved metallic saddle horn made of metal and covered with leather or any similar material, and having a removable cap secured to the body by a screw fastening, which serves to hold the leather in place on the pommel.

An improved hand sled has been patented by Mr. Joseph T. Pope, of Horseheads, N. Y. The invention consists in forming the runners of the sled with projecting shoulders for supporting and bracing the seat board, and in providing it with springs to ease the jolt of the sled in passing over gutters, etc.

Mr. Samuel H. Bell, of Mexico, Mo., has obtained a patent for an improved two wheeled vehicle The improvement relates to the axle, which is made arched with a connecting truss, whereby the axle is materially strengthened, and the invention further relates to the manner of attaching the body to the axle.

An improved buckle has been patented by Mr. Ezra L. Packer, of Toulon, Ill., which consists of a sliding and tilting dog arranged in such a manner that the tug may be easily lengthened and shortened without bending the leather, and held with great security by the dog and frame.

Mr. Thomas Kimball, of Chicago, Ill., has obtained a patent for a reversible shirt bosom which is so made that it may be worn to show a plain bosom on one side, and when turned exhibits a laced bosom of a different pattern or material, so that the wearer may have both a dress shirt and lawn tennis or yachting shirt combined in one garment.

Mr. D. Flannagan, of Kosse, Texas, has patented a feed governor for cotton gins, whereby the feeding will be automatically decreased when the cotton is fed into the roll box faster than it is being ginned and the feed will be finally stopped when the roll increases to a certain limit, and started again when the roll is reduced to a size previously fixed upon.

Mr. P. I. Harvey, of Amsterdam, N. Y., has recently patented an improved feed guide attachment for knitting machines, whereby one of the threads can be passed above the other at will, the raised thread showing on the outer surface of the knitted fabric. This invention is an improvement on the circular knitting machine patented by Mr. Harvey in February, 1882.

Some improvements in parallel dividers have recently been patented by Mr. James B. Tetley, of Pittsburg, Pa. The points of the dividers are attached to the ends of the legs in such a way that the points of the dividers will always be kept parallel to one another, whether they be brought toward or separated from one another.

Messrs. Kaufmann and Strauss, of No. 77 Duane Street, New York city, have by assignment from Mr. Wolff Hagelberg, of Berlin, Germany, patented a very simple and convenient bill of fare or card support. A brace is joined to a disk, between which and a projection on the brace the card or menu is secured for exposition. When not in use, and for shipping, the frame may be folded into small space.

An improved top cover for kerosene, gas, and other stoves, designed to facilitate the operation of cooking, has been patented by Mr. William H. Noyes, of Newburyport, Mass. This stove top is so constructed with sliding covers and an apertured box that the heat may be admitted to any portion of the stove as desired and a vessel placed on the stove may be subjected to any degree of heat that is required.

Messrs. Hans F. Arff and Detlef Bornholdt, of Arcadia, Iowa, have patented a game table upon which games are played with balls and pins, something after the manner of ten pins. It is an improvement upon the form of table in which the pins, after they are knocked down by the ball, are simultaneously set up by a pull rod running to the far end of the table and connected with the pins.

A sugar evaporating pan, so constructed that the cane juice is automatically skimmed as it boils up and flows over to the finishing part of the sugar pan, has been patented by Messrs. Richard D. Shindelbower and Henry Pressler, of Louisville, Ky. The boiling section of the pan is separated from the finishing section by a partition with which are connected strainers at the ends for separating the scum from the cane juice.

A very convenient device for holding paper bags and twine for use of grocers has been patented by Mr. Arthur W. Cash, of Decatur, Ill. A wire frame is provided with suitable arms for holding paper bags, and with tags displayed at each compartment to designate the size. A wire cage is provided in the center to hold a ball of twine. The holder is intended to be suspended above the counter, convenient to the clerk.

The combination with a hair or flesh brush of an induction coil and battery, which are set in a recess provided in the back of the brush for creating and transmitting to the flesh or roots of the hair an electric current while the brush is in use, promoting, the growth of hair, and claimed to be useful for curative purposes. Mr. Jos. N. Aronson, of London, England is the patentee.

A new composition has been patented by Messrs. Antonio Meucci, of Stapleton, N. Y., and Torello Deudi, of New York city, of a plastic paste for use in the manufacture of various articles of art and industry, such as billiard balls, statuary, vases, etc. The composition consists in gelatine fiber deprived of its mineral matter, varnish, oxide of zinc, terra alba, and an acid, all being mixed together, forming a hard and elastic substance which is cheap and non-explosive.

Mr. Duncan M. Buie, of Wilmington, N. C., is the patentee of an improved process of manufacturing oils from organic substances, which consists in injecting steam and carbonic acid gas into a retort heated to a high temperature and containing such material as pitch pine, sassafras, juniper, myrtle, peanuts, cotton seed, and other oil containing substances. The inventor claims that a larger quantity and superior quality of oil is thus produced.

An improved method of making button holes has been patented by Mr. James Ware, of Union Hill, N. J. The invention consists in making button holes by sewing narrow pieces of material together near the edges of their middle parts, then folding the edges down, then folding the pieces together at their middle parts, with the folded edges inward, and then sewing the pieces together along the opposite sides of the button holes and along the folded edge of the strip.

An improved fire extinguisher, intended especially for use in theaters, concert halls, etc., but which may also be used in hotels and other buildings, has been patented by Mr. G. F. Wagner, of Omaha, Neb. A system of spray pipes located in any suitable position in the building is connected with the main water pipe. Valves for regulating the flow and branches for directing the water to different parts of the building are also provided.

A contrivance to prevent the body of a wagon from being thrust upward unduly by the shocks and jolts caused by uneven roads has been patented by Mr. Oscar F. Lowe, of Hampton, Iowa. This consists in a double cranked rod pivoted in clips to the rear axle, and having two arms connected with the body of the wagon by rods, so that an undue weight on one side will bear with equal force on the other side. By this equalizing device a carriage is kept level irrespective of the position of the weight on the body.

An improvement in churns, whereby the churning operation will be expedited and the cleaning of the churn facilitated, has been patented by Mr. Edgar N. McKimm, of Lathrop, Mo. Bars for beating the cream are attached to the ends of the dashers, and are provided with holes through which the cream passes as the dasher is rotated. To the sides of the churn are attached horizontal bars, against which the cream is thrust by the dasher. Tubes are arranged in the upper part of the churn to admit a free circulation of air.

Mr. Charles Huck, of New Orleans, La., has obtained a patent for an improvement in telegraph and telephone cables designed to be run on posts or under the ground, as may be required. This consists in combining a series of bare ground wires with layers of insulated wires, the ground wires being twisted or wrapped in reverse direction to the insulated wires, and not allowed to touch, whereby the ground wires more perfectly carry off the induction, and the insulated wires are less liable to induced currents.

A very convenient household fixture consisting of a water reservoir, a warming oven, and a shelf to be used in connection with the pipe of a stove has been patented by Messrs. E. C. Strayer and Valentine Strayer, of Calmar, Iowa. This invention consists in an ordinary heating drum of oval shape and connected with the pipe of the stove, and of a pan or reservoir for holding water, which fits within this heating drum, the top of the covered reservoir forming a shelf upon which may be placed the food or plates to be warmed.

A composing stick for compositors, so constructed as to enable columns of different width to be set in the same stick, has been patented by Mr. Adolph Danziger, of New York city. The composing stick is provided with a transverse partition on its upper surface and between the ends, dividing the stick into two parts. An adjustable end piece is held on the stick at each side of the partition, thus permitting the stick to be adjusted for setting type for two columns of different widths on one stick.

An improved single tree for either single or double vehicles, to enable the horse or horses to be readily detached therefrom, has been patented by Mr. John F. McDaniel, of Letart, W. Va. This single tree is provided with swinging trace hooks, which are set free for liberating the trace by pulling a strap which passes into the interior of the carriage. In case, therefore, the horse becomes unmanageable, he may be immediately set at liberty, and injury to the occupants of the wagon avoided.

Messrs. C. S. Cummings and C. A. Shank, of Gloversville, N. Y., are the inventors of an improved process for converting leather scraps into paper or pasteboard. In the manufacture of paper or pasteboard from leather scrap or waste, the scraps are subjected to a bath of water, chloride of lime, and carbolic acid, and to successive drenches of lime water with potash, concentrated potash with water, and rinsing water, and the mass is ground into a pulp, either for use separately or to combine with straw or other vegetable matter as desired.

Mr. James Wilkes, of Winnipeg, Manitoba, Canada, has obtained a patent for a nut lock formed of two plates, one of which is provided with two squared apertures for receiving the nuts at the ends of the fish plates, and with a central tongue pressed out of the plane of the plate. The other locking plate has two recesses formed by prongs for receiving the middle nuts, and a tongue also pressed out of the plane of the plate, which tongue is passed in between the tongue of the former plate and the fish plate for the purpose of locking the middle nuts, which hold the locking plate against the fish plate.

Mr. Eugene E. Oudin, of New York city, has obtained a patent for imitation stained glass, which consists of a glass plate having imitation leads applied to one side, and the surface of the glass between the imitation leads coated with transparent colored varnish or lacquer. The imitation leads and the varnish or lacquer may be covered by a second glass plate of the same shape and size as the first plate, so that the imitation leads and the varnish or lacquer will be protected from the weather. By this invention a very good imitation of stained glass is produced at very moderate cost.

Mr. Adam Stierle, of Philadelphia, Pa., is the patentee of an improved dumping scow. This scow is divided longitudinally into two equal parts, which parts are firmly hinged together at the bottom and are held together at the top by a chain which passes over a windlass, and thence over pulleys on the opposite section from the windlass, and is attached at its end to a staple on the same section as the windlass. When the chain on the latter is unwound, the two sections will immediately open and careen in opposite directions, whereupon the material on the scow will slide off into the water. The sections as soon as they are relieved of their load will shut together automatically, and by the aid of the windlass may be held firmly together.

Mr. Clement E. Purdy, of Wooster, O., has obtained a patent for an improved skate which is so constructed that it may be used as an ice and parlor skate. The skate is provided with a series of grooved rollers, over which an endless belt is passed when the skate is to be used in the parlor, to prevent injury to the floor or carpet, and also to prevent the rollers from slipping on the floor. When the skate is to be used upon the ice, a runner is securely attached to the rollers of the skate by a hook point which passes over the front roller of the skate, and by a thumb screw which fastens the runner over the hind roller. The clamps which secure the skate to the sole of the shoe are so arranged that the skate may be adjusted to fit the shoes of persons differing in size.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Barrel, Keg, Hogshead, Stave Mach'y. See ad., p. 13.

Wanted, the address of party who can make shaped brush blocks, either of chestnut or sycamore. Woodbury Bros., 103 E. Houston Street, New York city.

W. F. Merrill, 27 Kilby St., Boston, Mass., Mechanical Draughtsman; special attention paid to detailed working drawings of experimental machinery, etc.

Wanted.—Light castings to make—Sewing machines, car boxes, school furniture, water closets, etc., etc. We do good work. Lehigh Stove Manuf. Co., Lehighton, Pa.

Contracts taken to manuf. small goods in sheet or cast brass, steel, or iron. Estimates given on receipt of model. H. C. Goodrich, 66 to 72 Ogden Place, Chicago.

Brush Electric Arc Lights and Storage Batteries. Twenty thousand Arc Lights already sold. Our largest machine gives 65 Arc Lights with 35 horse power. Our Storage Battery is the only practical one in the market. Brush Electric Co., Cleveland, O.

Engines, 10 to 50 horse power, complete, with governor, $250 to $550. Satisfaction guaranteed. More than eight hundred in use. For circular address Heald & Morris (Drawer 127), Baldwinsville, N. Y.

Best Squaring Shears, Tinners', and Canners' Tools at Niagara Stamping and Tool Company, Buffalo, N. Y.

Lathes 14 in. swing, with and without back gears and screw. J. Birkenhead, Mansfield, Mass.

Five foot planers, with modern improvements. Geo. S. Lincoln & Co., Phœnix Iron Works, Hartford, Conn.

The Best.—The Dueber Watch Case.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN Patent Agency, 261 Broadway, New York.

Farley's Directories of the Metal Workers, Hardware Trade, and Mines of the United States. Price $3.00 each. Farley, Paul & Baker, 530 Market Street, Phila.

Improved Skinner Portable Engines. Erie, Pa.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Lists 29, 30 & 31, describing 4,000 new and 2d-hand Machines, ready for distribution. State just what machines wanted. Forsaith & Co., Manchester, N. H., & N. Y. city.

"Abbe" Bolt Forging Machines and "Palmer" Power Hammers a specialty. Forsaith & Co., Manchester, N.H.

Railway and Machine Shop Equipment.
Send for Monthly Machinery List
to the George Place Machinery Company,
121 Chambers and 103 Reade Streets, New York.

25" Lathes of the best design. G. A. Ohl & Co., East Newark, N. J.

"How to Keep Boilers Clean." Book sent *free* by James F. Hotchkiss, 84 John St., New York.

Wanted.—Patented articles or machinery to make and introduce. Gaynor & Fitzgerald, New Haven, Conn.

Water purified for all purposes, from household supplies to those of largest cities, by the improved filters manufactured by the Newark Filtering Co., 177 Commerce St., Newark, N. J.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock Mfg. Co., 80 to 88 Market St., Chicago, Ill.

For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

Ice Making Machines and Machines for Cooling Breweries, etc. Pictet Artificial Ice Co. (Limited), 142 Greenwich Street. P. O. Box 3083, New York city.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Drop Forgings. Billings & Spencer Co. See adv., p. 382.

Woodwork'g Mach'y. Rollstone Mach. Co. Adv., p. 382.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 397.

The Sweetland Chuck. See illus. adv., p. 398.

Catalogues free.—Scientific Books, 100 pages; Electrical Books, 14 pages. E. & F. N. Spon, 35 Murray St., N. Y.

Knives for Woodworking Machinery, Bookbinders, and Paper Mills. Taylor, Stiles & Co., Riegelsville, N. J.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Peck's Patent Drop Press. See adv., page 12.

Curtis Pressure Regulator and Steam Trap. See p. 12.

Diamond Drills, J. Dickinson, 64 Nassau St., N. Y.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

50,000 Emerson's Hand Book of Saws. New Edition. Free. Address Emerson, Smith & Co., Beaver Falls, Pa.

Eagle Anvils, 10 cents per pound. Fully warranted.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 14.

Gould & Eberhardt's Machinists' Tools. See adv., p. 14.

Walrus Leather, Nickel Anodes, Turkey Emery, Pumice Stone and Composition. Greene, Tweed & Co., N.Y.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 12.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 14.

Lathes, Planers, Drills, with modern improvements. The Pratt & Whitney Co., Hartford, Conn.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

The Porter-Allen High Speed Steam Engine. Southwork Foundry & Mach. Co., 430 Washington Ave., Phil. Pa.

Lightning Screw Plates, Labor-saving Tools, p. 14.

Blake's Patent Belt Studs. Best & strongest fastening for Leather & Rubber Belts. Greene, Tweed & Co., N.Y.

NEW BOOKS AND PUBLICATIONS.

AN OUTLINE of QUALITATIVE ANALYSIS FOR BEGINNERS. By John T. Stoddard, Ph. D., Professor of Chemistry in Smith College. Gazette Printing Company, Northampton, Mass.

The book consists of two parts: detection of the metals, and detection of the acids, arranged in groups with directions for the analyses. A copious index makes this little manual valuable as a reference book in the laboratory.

THE QUEER, THE QUAINT, THE QUIZZICAL: A Cabinet for the Curious. By Frank H. Stauffer. R. Worthington, 770 Broadway, New York.

A collection of old time anecdotes, folk lore, and traditions. Fifteen double column pages of index, alphabetically arranged, make the book one of ready reference.

THE IMAGINATION, AND OTHER ESSAYS. By George Macdonald, LL.D. With an introduction by A. P. Peabody, D.D. D. Lothrop, Boston.

The subjects of the essays are thirteen in number, and range from literary criticism to homely truth telling on homely matters, in this latter respect reminding one of the Recreations of a Country Parson, published some twenty-five years ago, a collection, like this, bearing a true Scottish flavor. Time employed in reading George Macdonald cannot be time wasted.

AROUND THE RANCH. By Belle Kellogg Towne. D. Lothrop & Company, Boston.

A Colorado story, not entirely of rough mining life, although tinctured with the free Western coloring of untrammeled freedom.

MANUAL FOR ASSAYING GOLD, SILVER, COPPER, AND LEAD ORES. By Walter Lee Brown, Chemist and Assayer. Jansen, McClurg & Company, Chicago.

This handy volume, as to size, appears to contain sufficient information in the art of assaying the ores of four prominent and somewhat related metals, to entitle it to the claim of being a manual of instruction to beginners and amateurs. It is illustrated by engravings whenever these are useful and necessary, and by their aid and the use of the text, the beginner can easily understand all the steps necessary to acquire a knowledge of the qualities of these ores by analytical treatment. A large amount of additional information is given in a copious index.

A TREATISE ON EXPLOSIVE COMPOUNDS AND MACHINE ROCK DRILLS AND BLASTING. By Henry S. Drinker. John Wiley & Sons, 15 Astor Place, New York.

The title of this book does not half show forth its value. Instead of a "treatise" it is a history, and in addition to that it is really a manual for the engineer whose business takes him below the earth's surface. The author has given facts of mining reaching back to the earliest historical records, and has utilized some of the rare old engravings when mining was in its infancy. The illustrations of modern mining appliances are good, and add largely to the value of the volume, which is a handsome quarto of 400 pages. It contains a succinct history of all the modern tunnels, with plans made on a scale.

ECONOMIC ENTOMOLOGY IN IOWA.

The growing interest in economic entomology all over the country, even in those States which are not provided with State entomologists, is well illustrated by the constantly increasing number of publications on the subject, and, what is still more gratifying, these publications, as a rule, improve in quality. There is on our table a pamphlet of 42 pages, marked, "for gratuitous circulation," and entitled, "Entomological Papers from the Transactions of the Iowa State Horticultural Society for the Year 1882." The first paper therein is the prize essay, by the Hon. J. N. Dixon, on Orchards and Orchard Insects. It contains some very sound remarks on the "tramping remedy" for the various leaf folders or tortrices and especially for the curculio. Mr. Dixon writes from experience, and therefore with confidence. He is a strong advocate of Paris green, even for orchard insects.

The second paper, "Injurious Insects of 1882," by Miss Alice B. Walton, of Muscatine, Iowa, treats of various injurious species, dwelling upon their natural history and on the remedies to be employed. She considers the "tramping remedy" as not practicable in large orchards, and gives the experience of D. J. Weed, who raised a good crop of plums by fumigating the trees every two days with the smoke of burning coal tar. Further experience is certainly necessary before the value of this remedy can be established beyond doubt. Another interesting experience is the successful application of London purple for the red ants so troublesome in flower gardens. One teaspoonful of the purple mixed with a pint of water and poured into the entrance of the nest was sufficient either to kill or drive away the whole colony.

Prof. Herbert Osborne's "Entomological Notes for the Year 1882," which follows, contains observations on the habits of *Thripidæ*, the author concluding that "while the thrips have diversified food habits they are capable, as in the case of apple blossoms, of causing serious injury, and form a factor not to be neglected in the problem of failure in fruit bloom." The chapter on scale insects recapitulates the natural history of several species observed during the year, and quotes from our last annual report to the Department of Agriculture on kerosene emulsions.—*C. V. Riley.*

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) T. O. B. asks: What will kill, remove, or destroy red ants—small ones? Have tried all insect powders, but they fail. A. Place grease on pieces of paper, and distribute where the ants can get at it. Burn the papers when filled with ants. By following this method for a short time the colony will be annihilated.

(2) Oliver Bros. and others write: Can you give us a receipt for the substance used in putting up tablets to hold the edges, instead of glue and paper? The old process is too slow and unsatisfactory. A. The substance used on the edges of paper pads is composed of molasses and glue, with red coloring matter, such as fuchsine. The proportions are about the same as in printers' rollers. Probably considerably less molasses than is used in printers' rollers will answer for the purpose.

(3) T. T. M. asks: Would water glass be suitable for painting the bright parts of a bicycle, to protect them from rust? If not, please state what would. A. Have the parts nickeled, or varnish them with a hard white copal varnish.

(4) C. H. H., of Idaho Territory, writes: On the morning of the 19th of June, at about three o'clock, I saw in the northeast a very plainly defined rainbow in all but color, it being of a silvery white. It was a complete bow; a very heavy cloud—"thunder"—lay in the northeast, while the moon in the west, nearly down, was shining brightly. Are such occurrences common? Was it caused by the reflection from the moon? It was seen by several. A. It was a lunar rainbow. They have been frequently observed.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

P. E. W. Co.—The specimen is galenite—lead sulphide—and probably carries silver; it may contain bismuth, but is primarily an ore of lead or silver.—H. W. G.—No. 1 is a clay, and apparently of no value; it shows no sign of metal. No. 2 is a volcanic mineral, probably porphyrite trachyte.

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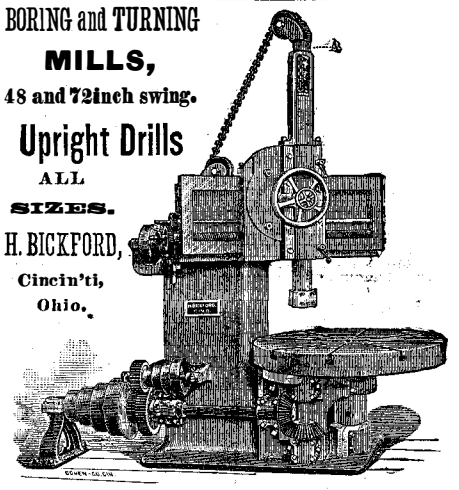

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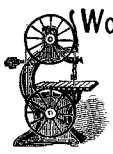
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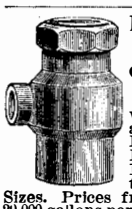

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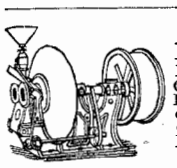

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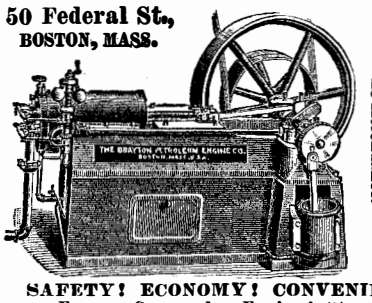

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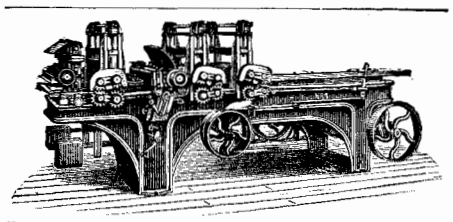

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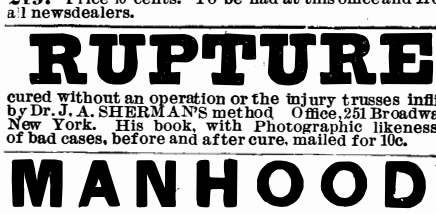

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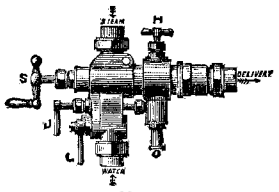

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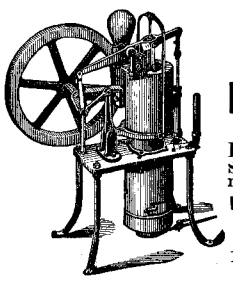

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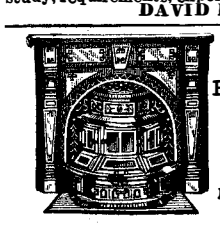

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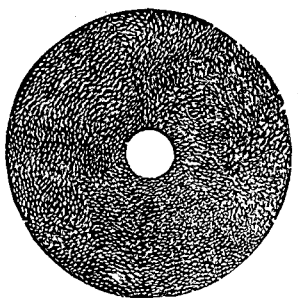

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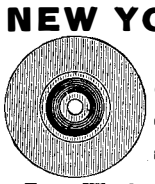

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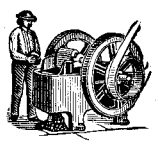

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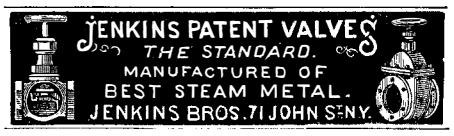

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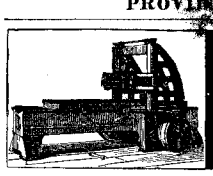

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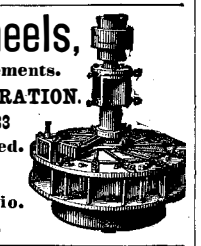

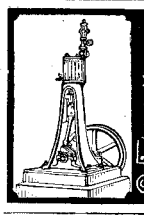

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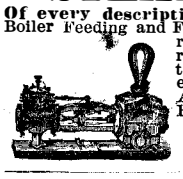

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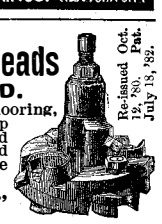

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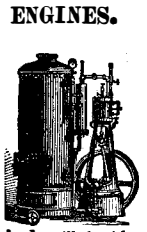

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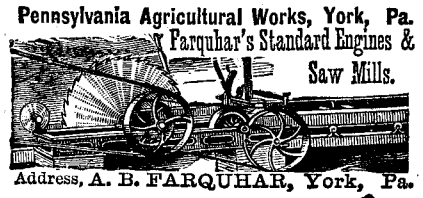

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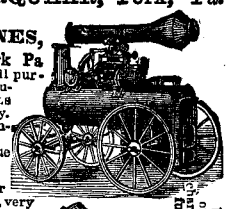

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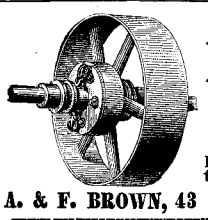

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